

**CAST IRON PIPE**  
**AND**  
**SPECIAL**  
**CASTINGS**



**Canada Iron Foundries**  
**LIMITED**  
**MONTREAL, CANADA**

# CAST IRON PIPE

BELL and SPIGOT, FLANGED,  
FLEXIBLE JOINT

FITTINGS and  
SPECIAL CASTINGS



**Canada Iron Foundries**  
LIMITED

HEAD OFFICE

**MONTREAL**

760 VICTORIA SQUARE

WORKS AT

THREE RIVERS, Que.

HAMILTON, Ont.

ST. THOMAS, Ont.

FORT WILLIAM, Ont.

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**ENGINEERING INSTITUTE OF CANADA  
STANDARD SPECIFICATIONS**

**FOR**

**Cast Iron Water Pipe and Special  
Castings**

**With Tables of Dimensions  
Thicknesses and Weights**

**MANUFACTURED BY THE**

**Canada Iron Foundries Limited**

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# ENGINEERING INSTITUTE OF CANADA

## STANDARD SPECIFICATIONS FOR CAST IRON PIPE AND SPECIAL CASTINGS

### DESCRIPTION OF PIPES

*Section 1.* The pipes shall be made with nub and spigot joints, and shall accurately conform to the dimensions given in Tables Nos. 1 and 2. They shall be straight and shall be true circles in section, with their inner and outer surfaces concentric, and shall be of the specified dimensions in outside diameter. They shall be at least 12 feet in length, exclusive of socket.

Pipes with thickness and weight intermediate between the classes in Table No. 2 shall be made of the same outside diameter as the next heavier class. Pipes with thickness and weight less than shown by Table No. 2 shall be made of the same outside diameter as the Class A pipe; and pipes with thickness and weight more than shown by Table No. 2 shall be made of the same outside diameter as the Class D pipe.

All pipes having the same outside diameter shall have the same inside diameter at both ends. The inside diameter of the lighter pipes of each standard outside diameter shall be gradually increased for a distance of about 6 inches from each end of the pipe so as to obtain the required standard thickness and weight for each size and class of pipe.

For pipes of each size from 4-inch to 24-inch inclusive, there shall be two standards of outside diameter, and for pipes from 30-inch to 60-inch inclusive, there shall be four standards of outside diameter, as shown by Table No. 1. The nominal diameters to be cast on pipes above 4-inch.

For pipes 4-inch to 12-inch inclusive, one class of special castings shall be furnished, made from Class D pattern. Those having spigot ends shall have outside diameters of spigot ends midway between the two standards of outside diameter as shown by Table No. 1, and shall be tapered back for a distance of 6 inches.

For pipes from 14 inches to 24 inches inclusive, two classes of special castings shall be furnished: Class B special castings with Classes A and B pipes, and Class D special castings with Classes C and D pipes; the former shall have cast on them the letters "AB" and the latter "CD." For pipes 30-inch to 60-inch inclusive, four classes of special castings shall be furnished, one for each class of pipe, and shall have cast on them the letter of the class to which they belong.

### ALLOWABLE VARIATION IN DIAMETER OF PIPES AND SOCKETS

*Section 2.* Especial care shall be taken to have the sockets of the required size. The sockets and spigots will be tested by circular gauges, and no pipe will be received which is defective in joint room from any cause. The diameters of the sockets and the outside diameters of the spigot ends of the pipes shall not vary from the standard dimensions by more than .06 of an inch for pipes 16 inches or less in diameter; .08 of an inch for 18-inch, 20-inch and 24-inch pipes; .10 of an inch for 30-inch, 36-inch and 42-inch pipes; .12 of an inch for 48-inch, and .15 of an inch for 54-inch and 60-inch pipes.



## ALLOWABLE VARIATION IN THICKNESS

**Section 3.** For pipes whose standard thickness is less than 1 inch, the thickness of metal in the body of the pipe shall not be more than .08 of an inch less than the standard thickness, and for pipes whose standard thickness is 1 inch or more, the variation shall not exceed .10 of an inch, except that for spaces not exceeding 8 inches in length in any direction, variations from the standard thickness of .02 of an inch in excess of the allowance above given shall be permitted.

For special castings of standard patterns a variation of 50 per cent. greater than allowed for straight pipes shall be permitted.

## DEFECTIVE SPIGOTS MAY BE CUT

**Section 4.** Defective Spigot ends on pipes 12 inches or more in diameter may be cut off in a lathe and a half-round wrought-iron band shrunk into a groove cut in the end of the pipe. Not more than 12 per cent. of the total number of accepted pipes of each size shall be cut and banded, and no pipe shall be banded which is less than 11 feet in length, exclusive of the socket.

In case the length of a pipe differs from 12 feet, the standard weight of the pipe given in Table No. 2 shall be modified in accordance therewith.

## SPECIAL CASTINGS

**Section 5.** All special castings shall be made in accordance with the cuts and the dimensions given in the tables forming a part of these specifications.

The diameters of the sockets and the external diameters of the spigot ends of the special castings shall not vary from the standard dimensions by more than .12 of an inch for castings 16 inches or less in diameter; .15 of an inch for 18-inch, 20-inch and 24-inch; .20 of an inch for 30-inch, 36-inch and 42-inch, and .24 of an inch for 48-inch, 54 inch and 60-inch. These variations apply only to special castings made from standard patterns.

The flanges on all manhole castings and manhole covers shall be faced true and smooth, and drilled to receive bolts of the sizes given in the tables. The manufacturer shall furnish and deliver all bolts for bolting on the manhole covers, the bolts to be of the sizes shown on plans and made of the best quality of mild steel, with hexagonal heads and nuts and sound, well-fitting threads.

## MARKING

**Section 6.** Every pipe and special casting shall have distinctly cast upon it the initials of the maker's name. When cast especially to order, each pipe larger than 4-inch may also have cast upon it figures showing the year in which it was cast and a number signifying the order in point of time in which it was cast, the figures denoting the year being above and the number below, thus:

1908  
1

1908  
2

1908  
3

etc., also any initials, not exceeding four, which may be required by the purchaser. The letters and figures shall be cast on the outside and shall not be less than 2 inches in length and  $\frac{1}{8}$  of an inch in relief for pipes 8 inches in



diameter and larger. For smaller sizes of pipes the letters may be 1 inch in length. The weight and the class letter shall be conspicuously painted in white on the inside of each pipe and special casting, after the coating has become hard.

#### ALLOWABLE PERCENTAGE OF VARIATION IN WEIGHT

*Section 7.* No pipe shall be accepted the weight of which shall be less than the standard weight by more than 5 per cent. for pipes 16 inches or less in diameter, and 4 per cent. for pipes more than 16 inches in diameter, and no excess above the standard weight of more than the given percentage for the several sizes shall be paid for. The total weight to be paid for shall not exceed for each size and class of pipe received the sum of the standard weights of the same number of pieces of the given size and class by more than 2 per cent.

No special casting shall be accepted the weight of which shall be less than the standard weight by more than 10 per cent. for pipes 12 inches or less in diameter, and 8 per cent. for larger sizes, except that curves, Y pieces and breeches pipe may be 12 per cent. below the standard weight, and no excess above the standard weight of more than the above percentages for the several sizes will be paid for. These variations apply only to castings made from the standard patterns.

#### QUALITY OF IRON

*Section 8.* All pipes and special castings shall be made of cast iron of good quality, and of such character as shall make the metal of the castings strong, tough, and of even grain, and soft enough to satisfactorily admit of drilling and cutting. The metal shall be made without any admixture of cinder iron or other inferior metal, and shall be remelted in a cupola or air furnace.

The contractor shall have the right to make and break three bars from each heat or run of metal, and the test shall be based upon the average results of the three bars. Should the dimensions of the three bars differ from those given below, a proper allowance therefor shall be made in the results of the tests.

#### TESTS OF MATERIAL

\**Section 9.* Specimen bars of the metal used, each being twenty-six inches long by two inches wide and one inch thick, shall be made without charge as often as the engineer may direct, and in default of definite instructions, the contractor shall make and test at least one bar from each heat or run of metal. The bars when placed flatwise upon supports twenty-four inches apart, and loaded in the centre, shall support a load of 1,900 pounds, and show a deflection of not less than .30 of an inch before breaking; or if preferred, tensile bars shall be made which will show a breaking point of not less than 19,000 pounds per square inch.

#### CASTING OF PIPE

*Section 10.* The straight pipes shall be cast in dry sand moulds in a vertical position. Pipes 16 inches or less in diameter shall be cast with the hub end up or down, as specified in the proposals. Pipes 18 inches or more in diameter shall be cast with the hub end down.

- \* Pipe may be made under higher metal tests when desired.
- Stock pipe may be made under metal tests as low as 1,800 pounds.

The pipes shall not be stripped or taken from the pit while showing colour of heat, but shall be left in the flasks for a sufficient length of time to prevent unequal contraction by subsequent exposure.

### QUALITY OF CASTINGS

*Section 11.* The pipes and special castings shall be smooth, free from scales, lumps, blisters, sand holes, and defects of every nature which unfit them for the use for which they are intended. No plugging or filling will be allowed.

### CLEANING AND INSPECTION

*Section 12.* All pipes and special castings shall be thoroughly cleaned and subjected to a careful hammer inspection. No casting shall be coated, unless entirely clean and free from rust, and approved in these respects, immediately before being dipped, by the engineer.

### COATING

*Section 13.* Every pipe and special casting shall be coated inside and out with coal-tar pitch varnish. The varnish shall be made from coal tar. To this material sufficient oil shall be added to make a smooth coating, tough and tenacious when cold, and not brittle nor with any tendency to scale off.

Each casting shall be heated to a temperature of 300 degrees Fahrenheit immediately before it is dipped, and shall have not less than this temperature at the time it is put in the vat. The ovens in which the pipes are heated shall be so arranged that all portions of the pipe shall be heated to an even temperature. Each casting shall remain in the bath at least five minutes.

The varnish shall be heated to a temperature of 300 degrees Fahrenheit (or less if the engineer shall so order), and shall be maintained at this temperature during the time the casting is immersed.

Fresh pitch and oil shall be added when necessary to keep the mixture at the proper consistency, and the vat shall be emptied of its contents and re-filled with fresh pitch when deemed necessary by the engineer. After being coated the pipe shall be carefully drained of the surplus varnish. Any pipe or special casting that is to be recoated shall first be thoroughly scraped and cleaned.

### HYDROSTATIC TEST

*Section 14.* When the coating has become hard, the straight pipes shall be subjected to a proof by hydrostatic pressure, and, if required by the engineer, they shall also be subjected to a hammer test under this pressure.

The pressure to which the different sizes and classes of pipes shall be subjected are as follows:—

	20-inch Diameter and larger Pounds per sq. inch	Less than 20-inch Diameter Pounds per sq. inch
Class A Pipe . . . . .	150	300
Class B Pipe . . . . .	200	300
Class C Pipe . . . . .	250	300
Class D Pipe . . . . .	300	300

## WEIGHING

*Section 15.* The pipes and special castings shall be weighed for payment under the supervision of the engineer after the application of the coal-tar pitch varnish. If desired by the engineer, the pipes and special castings shall be weighed after their delivery, and the weights so ascertained shall be used in the final settlement, provided such weighing is done by a legalized weighmaster. Bids shall be submitted and a final settlement made upon the basis of a ton of 2,000 pounds.

## CONTRACTOR TO FURNISH MEN AND MATERIAL

*Section 16.* The contractor shall provide all tools, testing machines, materials, and men necessary for the required testing, inspection, and weighing at the foundry of the pipe and special castings; and should the purchaser have no inspector at the works, the contractor shall, if required by the engineer, furnish a sworn statement that all of the tests have been made as specified, this statement to contain the results of the tests upon the test bars.

## POWER OF ENGINEER TO INSPECT

*Section 17.* The engineer shall be at liberty at all times to inspect the material at the foundry, and the moulding, casting and coating of the pipes and special castings. The forms, sizes, uniformity and condition of all pipes and other castings herein referred to shall be subject to his inspection and approval, and he may reject, without proving, any pipe or other casting which, in his opinion, is not in conformity with the specifications or drawings.

## INSPECTOR TO REPORT

*Section 18.* The inspector at the foundry shall report daily to the foundry office all pipes and special castings rejected, with the causes for rejection.

## CASTINGS TO BE DELIVERED SOUND AND PERFECT

*Section 19.* All the pipes and other castings must be delivered in all respects sound and conformable to these specifications. The inspection shall not relieve the contractor of any of his obligations in this respect, and any defective pipes or other castings which may have passed the engineer at the works or elsewhere shall be at all times liable to rejection when discovered, until the final completion and adjustment of the contract; provided, however, that the contractor shall not be held liable for pipes or special castings found to be cracked after they have been accepted at the agreed point of delivery. Care shall be taken in handling the pipes not to injure the coating, and no pipes or other material of any kind shall be placed in the pipes during transportation or at any time after they have received the coating.

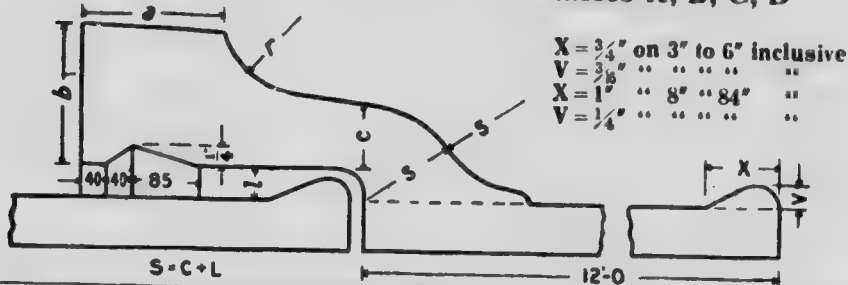
## DEFINITION OF THE WORD "ENGINEER"

*Section 20.* Wherever the word "engineer" is used herein it shall be understood to refer to the engineer or inspector acting for the purchaser and to his properly authorized agents, limited by the particular duties intrusted to them.

# ENGINEERING INSTITUTE OF CANADA STANDARD DIMENSIONS OF PIPE

Table No. 1

Classes A, B, C, D



Nominal Diam. Inches	Classes	Actual Outside Diam. Inches	Diam. of Sockets		Depth of Sockets		A	B	C
			Pipe Inches	Special Castings Inches	Pipe Inches	Special Castings Inches			
4	A	4.80	5.60	5.70	3.50	4.00	1.5	1.30	.65
4	B-C-D	5.00	5.80	5.70	3.50	4.00	1.5	1.30	.65
6	A	6.90	7.70	7.80	3.50	4.00	1.5	1.40	.70
6	B-C-D	7.10	7.90	7.80	3.50	4.00	1.5	1.40	.70
8	A-B	9.05	9.85	10.00	4.00	4.00	1.5	1.50	.75
8	C-D	9.30	10.10	10.00	4.00	4.00	1.5	1.50	.75
10	A-B	11.10	11.90	12.10	4.00	4.00	1.5	1.50	.75
10	C-D	11.40	12.20	12.10	4.00	4.00	1.5	1.60	.80
12	A-B	13.20	14.00	14.20	4.00	4.00	1.5	1.60	.80
12	C-D	13.50	14.30	14.20	4.00	4.00	1.5	1.70	.85
14	A-B	15.30	16.10	16.10	4.00	4.00	1.5	1.70	.85
14	C-D	15.65	16.45	16.45	4.00	4.00	1.5	1.80	.90
16	A-B	17.40	18.40	18.40	4.00	4.00	1.75	1.80	.90
16	C-D	17.80	18.80	18.80	4.00	4.00	1.75	1.90	1.00
18	A-B	19.50	20.50	20.50	4.00	4.00	1.75	1.90	.95
18	C-D	19.92	20.92	20.92	4.00	4.00	1.75	2.10	1.05
20	A-B	21.60	22.60	22.60	4.00	4.00	1.75	2.00	1.00
20	C-D	22.06	23.06	23.06	4.00	4.00	1.75	2.30	1.15
24	A-B	25.80	26.80	26.80	4.00	4.00	2.00	2.10	1.05
24	C-D	26.32	27.32	27.32	4.00	4.00	2.00	2.50	1.25
30	A	31.74	32.74	32.74	4.50	4.50	2.00	2.30	1.15
30	B	32.00	33.00	33.00	4.50	4.50	2.00	2.30	1.15
30	C	32.40	33.40	33.40	4.50	4.50	2.00	2.60	1.32
30	D	32.74	33.74	33.74	4.50	4.50	2.00	3.00	1.50
36	A	37.96	38.96	38.96	4.50	4.50	2.00	2.50	1.25
36	B	38.30	39.30	39.30	4.50	4.50	2.00	2.80	1.40
36	C	38.70	39.70	39.70	4.50	4.50	2.00	3.10	1.60
36	D	39.16	40.16	40.16	4.50	4.50	2.00	3.40	1.80
42	A	44.20	45.20	45.20	5.00	5.00	2.00	2.80	1.40
42	B	44.50	45.50	45.50	5.00	5.00	2.00	3.00	1.50
42	C	45.10	46.10	46.10	5.00	5.00	2.00	3.40	1.75
42	D	45.58	46.58	46.58	5.00	5.00	2.00	3.80	1.95
48	A	50.50	51.50	51.50	5.00	5.00	2.00	3.00	1.50
48	B	50.80	51.80	51.80	5.00	5.00	2.00	3.30	1.65
48	C	51.40	52.40	52.40	5.00	5.00	2.00	3.80	1.95
48	D	51.98	52.98	52.98	5.00	5.00	2.00	4.20	2.20
54	A	56.66	57.66	57.66	5.50	5.50	2.25	3.20	1.80
54	B	57.10	58.10	58.10	5.50	5.50	2.25	3.60	1.80
54	C	57.80	58.80	58.80	5.50	5.50	2.25	4.00	2.15
54	D	58.40	59.40	59.40	5.50	5.50	2.25	4.40	2.45
60	A	62.80	63.80	63.80	5.50	5.50	2.25	3.40	1.70
60	B	63.40	64.40	64.40	5.50	5.50	2.25	3.70	1.90
60	C	64.20	65.20	65.20	5.50	5.50	2.25	4.20	2.25
60	D	64.82	65.82	65.82	5.50	5.50	2.25	4.70	2.60
72	A	75.34	76.34	76.34	5.50	5.50	2.25	3.80	1.87
72	B	76.00	77.00	77.00	5.50	5.50	2.25	4.20	2.20
72	C	76.88	77.88	77.88	5.50	5.50	2.25	4.60	2.64
84	A	87.54	88.54	88.54	5.50	5.50	2.50	4.10	2.10
84	B	88.54	89.54	89.54	5.50	5.50	2.50	4.50	2.60

# ENGINEERING INSTITUTE OF CANADA

## STANDARD THICKNESS AND WEIGHTS OF CAST IRON PIPE

Table No. 2

Classes A, B, C, D

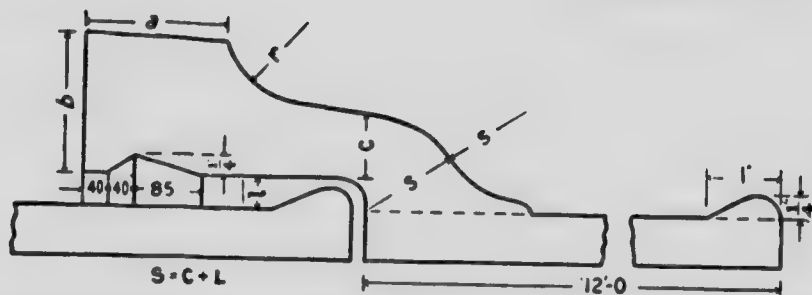
Nominal Inside Diameter Inches	CLASS A 100-Feet Head 43 Pounds Pressure			CLASS B 200-Feet Head 86 Pounds Pressure			CLASS C 300-Feet Head 130 Pounds Pressure			CLASS D 400-Feet Head 173 Pounds Pressure			Nominal Inside Diameter Inches
	Thick- ness Inches	Weight per		Thick- ness Inches	Weight per		Thick- ness Inches	Weight per		Thick- ness Inches	Weight per		
		Foot	Length		Foot	Length		Foot	Length		Foot	Length	
4	.42	26.5	240	.45	21.7	260	.48	23.3	280	.52	25.0	300	4
6	.44	30.8	370	.48	33.3	400	.51	35.8	430	.55	38.3	460	6
8	.46	42.9	515	.51	47.5	570	.56	52.1	625	.60	55.8	670	8
10	.50	57.1	685	.57	63.8	765	.62	70.8	850	.68	76.7	920	10
12	.54	72.5	870	.62	82.1	985	.68	91.7	1100	.75	100.0	1200	12
14	.57	89.6	1075	.66	102.5	1230	.74	116.7	1400	.82	129.2	1550	14
16	.60	108.3	1300	.70	125.0	1500	.80	143.8	1725	.89	158.3	1900	16
18	.64	129.2	1550	.75	150.0	1800	.87	175.0	2100	.96	191.7	2300	18
20	.67	150.0	1800	.80	175.0	2100	.92	208.3	2500	1.03	229.2	2750	20
24	.76	201.2	2450	.89	233.3	2800	1.04	279.2	3350	1.16	305.7	3650	24
30	.88	291.7	3500	1.03	333.3	4000	1.20	400.0	4800	1.37	450.0	5400	30
36	.99	391.7	4700	1.15	454.2	5450	1.36	545.8	6550	1.58	625.0	7500	36
42	1.10	512.5	6150	1.28	591.7	7100	1.54	716.7	8600	1.78	825.0	9900	42
48	1.26	666.7	8000	1.42	750.0	9000	1.71	908.3	10900	1.96	1050.0	12600	48
54	1.35	800.0	9600	1.55	933.3	11200	1.90	1141.7	13700	2.23	1341.7	16100	54
60	1.39	916.7	11000	1.67	1101.2	13250	2.00	1341.7	16100	2.38	1583.3	19000	60
72	1.62	1283.4	15100	1.95	1545.8	18550	2.39	1901.2	22850	.....	.....	.....	72
84	1.72	1633.4	19600	2.22	2104.2	25250	.....	.....	.....	.....	.....	.....	84

The above weights are per length to lay 12 feet, including standard sockets; proportionate allowance to be made for any variation.

**ENGINEERING INSTITUTE OF CANADA**  
**STANDARD DIMENSIONS OF PIPE**  
**High Pressure Service**

**Table No. 3**

**Classes E, F, G, H**



Nominal Diam. Ins.	Classes	Actual Outside Diam. Inches	Diam. of Sockets		A	B	C	R	Nominal Diam. Ins.
			Pipe and Specials	Depth of Sockets					
6	E-F	7.22	8.02	4.00	1.50	1.75	.75	1.10	6
6	G-H	7.38	8.18	4.00	1.50	1.85	.85	1.10	6
8	E-F	9.42	10.22	4.00	1.50	1.85	.85	1.10	8
8	G-H	9.60	10.40	4.00	1.50	1.95	.95	1.10	8
10	E-F	11.60	12.40	4.50	1.75	1.95	.95	1.10	10
10	G-H	11.84	12.64	4.50	1.75	2.05	1.05	1.10	10
12	E-F	13.78	14.58	4.50	1.75	2.05	1.05	1.10	12
12	G-H	14.08	14.88	4.50	1.75	2.20	1.20	1.10	12
14	E-F	15.98	16.78	4.50	2.00	2.15	1.15	1.10	14
14	G-H	16.32	17.12	4.50	2.00	2.35	1.35	1.10	14
16	E-F	18.16	18.96	4.50	2.00	2.30	1.25	1.15	16
16	G-H	18.54	19.34	4.50	2.00	2.55	1.45	1.15	16
18	E-F	20.34	21.14	4.50	2.25	2.45	1.40	1.15	18
18	G-H	20.78	21.58	4.50	2.25	2.75	1.65	1.15	18
20	E-F	22.54	23.34	4.50	2.25	2.55	1.50	1.15	20
20	G-H	23.02	23.82	4.50	2.25	2.85	1.75	1.20	20
24	E-F	26.90	27.90	5.00	2.25	2.85	1.70	1.20	24
30	E	33.10	34.10	5.00	2.25	3.25	1.80	1.50	30
30	F	33.46	34.46	5.00	2.25	3.50	2.00	1.55	30
36	E	39.60	40.60	5.00	2.25	3.70	2.05	1.70	36
36	F	40.04	41.04	5.00	2.25	4.00	2.30	1.80	36



**ENGINEERING INSTITUTE OF CANADA**  
**STANDARD THICKNESS AND WEIGHTS OF CAST IRON PIPE**  
**For Fire Lines and Other High Pressure Service**

**Table No. 4**

**Classes E, F, G, H**

Nominal Inside Diameter Inches	CLASS E 500-Feet Head 217 Pounds Pressure			CLASS F 600-Feet Head 260 Pounds Pressure			CLASS G 700-Feet Head 340 Pounds Pressure			CLASS H 800-Feet Head 347 Pounds Pressure			Nominal Inside Diameter Inches
	Thick- ness Inches	Weight per		Thick- ness Inches	Weight per		Thick- ness Inches	Weight per		Thick- ness Inches	Weight per		
		Foot	Length		Foot	Length		Foot	Length		Foot	Length	
6	.58	41.7	500	.61	43.3	520	.65	47.1	565	.69	49.6	595	6
8	.66	61.7	710	.71	65.7	790	.75	70.8	850	.80	75.0	900	8
10	.74	86.3	1035	.80	92.1	1105	.86	100.9	1210	.92	106.7	1280	10
12	.82	113.8	1365	.89	122.1	1465	.97	135.4	1625	1.04	143.8	1725	12
14	.90	145.0	1740	.99	157.5	1890	1.07	174.2	2090	1.16	186.7	2240	14
16	.98	179.6	2155	1.08	195.4	2315	1.18	219.2	2620	1.27	232.5	2790	16
18	1.07	220.4	2645	1.17	238.4	2860	1.28	267.1	3205	1.39	286.7	3440	18
20	1.15	263.0	3155	1.27	286.3	3435	1.39	320.8	3850	1.51	344.6	4135	20
24	1.31	359.6	4315	1.45	392.9	4715	.....	.....	.....	.....	.....	.....	24
30	1.55	521.7	6260	1.73	585.4	7025	.....	.....	.....	.....	.....	.....	30
36	1.80	725.0	8700	2.02	820.0	9840	.....	.....	.....	.....	.....	.....	36

The above weights are per length to lay 12 ft., including standard sockets; proportionate allowance to be made for any variation.

**For HIGH PRESSURE PIPE** from 6 inches to 24 inches inclusive, one class of special castings shall be furnished for Classes E and F pipe, and one class of special castings for Classes G and H pipe. **For 30-inch and 36-inch pipe**, one class of special castings shall be furnished for each class of pipe.

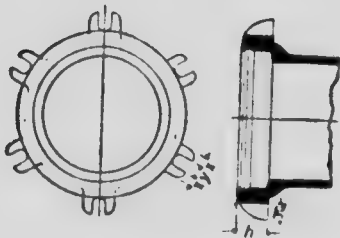
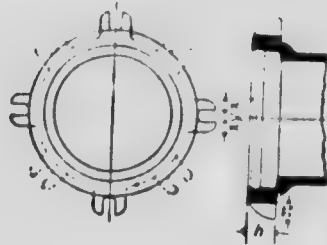
# ENGINEERING INSTITUTE OF CANADA STANDARD LUGS

## Number and Weights of Lugs on Outlets of Different Sizes

Table No. 5

4 Lugs, 12-14 inches

8 Lugs, 42-60 inches



6 Lugs, 16-36 inches

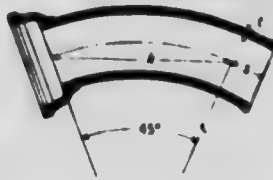
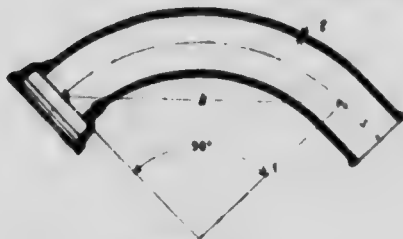
Nominal Diameter Outlet Inches	Number of Pairs of Lugs	Approximate Weight Lugs on One Bell Pounds	Nominal Diameter Outlet Inches	Number of Pairs of Lugs	Approximate Weight Lugs on One Bell Pounds
12	4	32	30	6	80
14	4	32	36	6	80
16	6	56	42	8	111
18	6	56	48	8	114
20	6	56	54	8	134
24	6	56	60	8	137

Two pairs of lugs are placed on the vertical axis of each bell, the others at equal distances around circumference. H is equal depth of bell on all sizes.

G equals 2.50 inches, X equals 1.25 inches, Y equals 1.63 inches for 12 to 24 inches inclusive.

G equals 3.00 inches, X equals 1.50 inches, Y equals 2.00 inches for 30 to 60 inches inclusive.

**ENGINEERING INSTITUTE OF CANADA  
STANDARD SPECIAL CASTINGS FOR WATER**  
Standard Curves, Bell and Spigot,  $\frac{1}{4}$ ,  $\frac{1}{8}$ ,  $\frac{1}{16}$



**TABLE No. 6**

1/4 Curves					
Nominal Diam., in	Class	Dimensions, Inches			Approx. Weight Pounds
		t	r	k	
4	D	.52	16	22 60	82
6	D	.55	16	22 60	130
8	D	.60	16	22 60	200
10	D	.68	16	22 60	278
12	D	.75	16	22 60	366
14	B	.66	18	25 50	406
14	D	.82	18	25 50	504
16	B	.70	24	34 00	594
16	D	.89	24	34 00	750
18	B	.75	24	34 00	710
18	D	.96	24	34 00	888
20	B	.80	24	34 00	840
20	D	1 03	24	34 00	1070
24	B	.89	30	42 40	1290
24	D	1.16	30	42 40	1656
30	A	.88	36	50 90	1814
30	B	1 03	36	50 90	2082
30	C	1 20	36	50 90	2454
30	D	1.37	36	50 90	2836
36	A	.99	48	67 90	2961
36	B	1.15	48	67 90	3500
36	C	1.36	48	67 90	4120
36	D	1.58	48	67 90	4820

**TABLE No. 7**

1/8 Curves					1/16 Curves			
Nominal Diam., In.	Class	t	r	k	Approx. Weight Pounds	r	k	Approx. Weight Pounds
4	D	.52	24	18 40	66	48	18 70	66
6	D	.55	24	18 40	105	48	18 70	105
8	D	.60	24	18 40	150	48	18 70	150
10	D	.68	24	18 40	202	48	18 70	202
12	D	.75	24	18 40	265	48	18 70	265
14	B	.66	36	27 60	350	72	28 10	312
14	D	.82	36	27 60	442	72	28 10	382
16	B	.70	36	27 60	445	72	28 10	388
16	D	.89	36	27 60	558	72	28 10	484
18	B	.75	36	27 60	533	72	28 10	464
18	D	.96	36	27 60	663	72	28 10	574
20	B	.80	48	36 70	758	96	37 50	676
20	D	1 03	48	36 70	964	96	37 50	858
24	B	.89	60	45 90	1181	120	46 80	1072
24	D	1 16	60	45 90	1515	120	46 80	1372
30	A	.88	60	45 90	1475	120	46 80	1342
30	B	1 03	60	45 90	1684	120	46 80	1528
30	C	1 20	60	45 90	1983	120	46 80	1800
30	D	1 37	60	45 90	2291	120	46 80	2080
36	A	.99	90	68 90	2472	180	70 20	2472
36	B	1 15	90	68 90	2916	180	70 20	2916
36	C	1 36	90	68 90	3430	180	70 20	3430
36	D	1 58	90	68 90	4012	180	70 20	4012
42	A	1 10	90	68 90	3286	180	70 20	3286
42	B	1 28	90	68 90	3778	180	70 20	3778
42	C	1 54	90	68 90	4600	180	70 20	4600
42	D	1 78	90	68 90	5360	180	70 20	5360
48	A	1 26	90	68 90	4230	180	70 20	4230
48	B	1 42	90	68 90	4820	180	70 20	4820
48	C	1 71	90	68 90	5796	180	70 20	5796
48	D	1 96	90	68 90	6750	180	70 20	6750
54	A	1 35	90	68 90	5180	180	70 20	5180
54	B	1 55	90	68 90	5990	180	70 20	5990
54	C	1 90	90	68 90	7330	180	70 20	7330
54	D	2 23	90	68 90	8620	180	70 20	8620
60	A	1 39	90	68 90	5990	180	70 20	5990
60	B	1 67	90	68 90	7130	180	70 20	7130
60	C	2 00	90	68 90	8590	180	70 20	8590
60	D	2 38	90	68 90	10240	180	70 20	10240

S=8 inches on sizes 4 and 6 inches. S=6 inches on  $\frac{1}{8}$  Curves on sizes 4 to 30 inches inclusive.

S=10 inches on sizes 8 inches. S=6 inches on  $\frac{1}{16}$  Curves on sizes 4 to 12 inches inclusive.

S=12 inches on sizes 10 to 36 inches. All weights are approximate.

**ENGINEERING INSTITUTE OF CANADA  
STANDARD SPECIAL CASTINGS FOR WATER  
Standard Curves, Bell and Spigot—Standard Offsets**

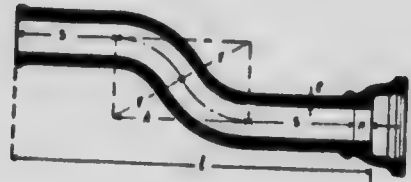
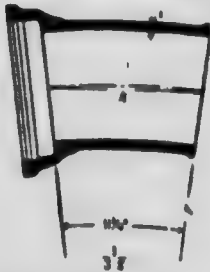


TABLE No. 8

TABLE No. 9

⌘ Curves					⌘ Curves					⌘ Curves				
Nominal Diam., In.	Class	t	r	k	Approx. Weight Pounds	r	k	Approx. Weight Pounds	Nominal Diam., Inches	Class	r	i	Approx. Weight Pounds	
4	D	.52	120	23.52	66				4	D	8	35.85	91	
6	D	.55	120	23.52	104				6	D	14	46.25	183	
8	D	.60	120	23.52	150				8	D	15	48.00	280	
10	D	.68	120	23.52	192				10	D	16	49.70	390	
12	D	.75	120	23.52	250				12	D	17	51.45	530	
14	B	.66	180	35.28	364				14	B	18	53.70	555	
14	D	.82	180	35.28	450				14	D	18	53.70	695	
16	B	.70	180	35.28	453				16	B	19	55.40	708	
16	D	.89	180	35.28	570				16	D	19	55.40	900	
18	B	.75	180	35.28	542									
18	D	.96	180	35.28	674									
20	B	.80	240	47.05	808	480	47.10	808						
20	D	1.03	240	47.05	1028	480	47.10	1028						
24	B	.89	240	47.05	1080	480	47.10	1080						
24	D	1.16	240	47.05	1380	480	47.10	1380						
30	A	.88	240	47.05	1350	480	47.10	1350						
30	B	1.03	240	47.05	1540	480	47.10	1540						
30	C	1.20	240	47.05	1810	480	47.10	1810						
30	D	1.37	240	47.05	2090	480	47.10	2090						
36	A	.99	240	47.05	1790	480	47.10	1790						
36	B	1.15	240	47.05	2100	480	47.10	2100						
36	G	1.36	240	47.05	2470	480	47.10	2470						
36	D	1.58	240	47.05	2880	480	47.10	2880						
42	A	1.10	240	47.05	2380	480	47.10	2380						
42	B	1.28	240	47.05	2720	480	47.10	2720						
42	C	1.54	240	47.05	3310	480	47.10	3310						
42	D	1.78	240	47.05	3850	480	47.10	3850						
48	A	1.26	240	47.05	3150	480	47.10	3150						
48	B	1.42	240	47.05	3480	480	47.10	3480						
48	C	1.71	240	47.05	4170	480	47.10	4170						
48	D	1.96	240	47.05	4860	480	47.10	4860						
54	A	1.35	240	47.05	3750	480	47.10	3750						
54	B	1.55	240	47.05	4330	480	47.10	4330						
54	C	1.90	240	47.05	5290	480	47.10	5290						
54	D	2.33	240	47.05	6220	480	47.10	6220						
60	A	1.39	240	47.05	4340	480	47.10	4340						
60	B	1.67	240	47.05	5140	480	47.10	5140						
60	C	2.00	240	47.05	6200	480	47.10	6200						
60	D	2.38	240	47.05	7400	480	47.10	7400						

Nominal Diam., In.		Class	t	k	s	n
4	D		.52	13.85	10.00	2.00
6	D		.55	24.25	10.00	2.00
8	D		.60	26.00	10.00	2.00
10	D		.68	27.70	10.00	2.00
12	D		.75	29.45	10.00	2.00
14	B		.66	31.20	10.00	2.50
14	D		.82	31.20	10.00	2.50
16	B		.70	32.90	10.00	2.50
16	D		.89	32.90	10.00	2.50

# ENGINEERING INSTITUTE OF CANADA STANDARD SPECIAL CASTINGS FOR WATER

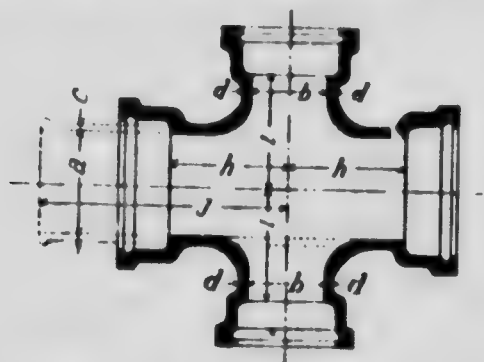


Table No. 10 Standard Branches

Nominal Diam Inches		Class	Dimensions, Inches			Approximate Weights, Pounds			
A	B		H	J	I	3-Way Branches		4-Way Branches	
						2 Bells	3 Bells	3 Bells	4 Bells
4	3	D	11	23	11	121	120	153	153
4	4	D	11	23	11	125	128	164	166
6	3	D	12	24	12	173	170	207	204
6	4	D	12	24	12	185	183	223	221
6	6	D	12	24	12	203	200	259	257
8	4	D	13	25	13	26	255	301	294
8	6	D	13	25	13	278	270	333	325
8	8	D	13	25	13	301		378	372
10	4	D	14	26	14	356	355	395	377
10	6	D	14	26	14	371	352	424	406
10	8	D	14	26	14	389	371	461	4
10	10	D	14	26	14	414	395	511	495
12	4	D	15	27	15	473	445	514	495
12	6	D	15	27	15	486	458	540	512
12	8	D	15	27	15	502	474	573	545
12	10	D	15	27	15	519	491	605	577
12	12	D	15	27	15	540	512	651	623
14	4	B	16	28	16	485	480	535	530
14	4	D	16	28	16	614	588	666	641
14	6	B	16	28	16	500	495	560	555
14	8	D	16	28	16	634	608	730	700
14	8	B	16	28	16	515	510	600	595
14	8	D	16	28	16	682	636	787	761
14	10	B	16	28	16	535	525	635	625
14	10	D	16	28	16	679	653	822	796
14	12	B	16	28	16	560	550	680	670
14	12	D	16	28	16	698	672	860	834
14	14	B	16	28	16	575	569	723	715
14	14	D	16	28	16	750	724	938	963
16	4	B	17	29	17	615	610	675	670

**ENGINEERING INSTITUTE OF CANADA  
STANDARD SPECIAL CASTINGS FOR WATER**

**Table No. 10—Continued. Standard Branches**

Nominal Diam. Inches		Class	Dimensions, Inches			Approximate Weights, Pounds			
A	B		H	J	I	3-Way Branches		4-Way Branches	
						2 Bells	3 Bells	3 Bells	4 Bells
16	4	D	17	29	17	783	760		
16	6	B	17	29	17	630	625	864	841
16	6	D	17	29	17	802	779	695	690
16	8	B	17	29	17	645	640	902	879
16	8	D	17	29	17	831	808	730	725
16	10	B	17	29	17	660	655	961	938
								760	755
16	10	D	17	29	17	872	849		
16	12	B	17	29	17	685	680	1042	1019
16	12	D	17	29	17	884	861	805	800
16	14	B	17	29	17	695	690	1006	1043
16	14	D	17	29	17	903	880	825	820
16	16	B	17	29	17	720	727	1104	1082
								904	901
16	16	D	17	29	17	991	969		
18	4	B	18	30	18	755	750	1282	1259
18	4	D	18	30	18	953	927	820	815
18	6	B	18	30	18	765	760	1016	1020
18	6	D	18	30	18	968	942	840	835
18	8	B	18	30	18	780	775	1075	1049
								870	865
18	8	D	18	30	18	1000	974		
18	10	B	18	30	18	795	790	1140	1114
18	10	D	18	30	18	1038	1012	900	895
18	12	B	18	30	18	815	810	1216	1190
18	12	D	18	30	18	1075	1049	940	935
18	14	B	18	30	18	825	820	1290	1264
								955	950
18	14	D	18	30	18	1083	1057		
18	16	B	18	30	18	855	850	1306	1280
18	16	D	18	30	18	1108	1082	1020	1015
18	18	B	18	30	18	896	889	1356	1330
18	18	D	18	30	18	1170	1144	1101	1096
20	4	B	19	31	19	923	916	1480	1454
								1006	999
20	4	D	19	31	19	1172	1148		
20	6	B	19	31	19	930	920	1273	1248
20	6	D	19	31	19	1188	1164	1010	1000
20	8	B	19	31	19	945	935	1304	1280
20	8	D	19	31	19	1212	1188	1035	1025
20	10	B	19	31	19	955	945	1352	1328
								1060	1050
20	10	D	19	31	19	1252	1227		
20	12	B	19	31	19	975	965	1431	1407
20	12	D	19	31	19	1288	1263	1100	1090
20	14	B	19	31	19	980	970	1502	1479
20	14	D	19	31	19	1342	1318	1110	1100
								1613	1588
20	16	B	19	31	19	1010	1000		
20	16	D	19	31	19	1347	1323	1170	1160
20	18	B	19	31	19	1035	1025	1622	1597
20	18	D	19	31	19	1365	1341	1225	1215
20	20	B	19	31	19	1077	1070	1658	1634
								1314	1307



# ENGINEERING INSTITUTE OF CANADA STANDARD SPECIAL CASTINGS FOR WATER

Table No. 10--Continued. Standard Branches

Nominal Diam. Inches		Class	Dimensions Inches			Approximate Weights, Pounds			
A	B		H	J	I	3-Way Branches		4-Way Branches	
						2 Bells	3 Bells	3 Bells	4 Bells
20	20	D	19	31	19	1462	1438	1852	1828
24	6	B	21	33	21	1309	1289	1425	1405
24	6	D	21	33	21	1670	1637	1809	1775
24	8	B	21	33	21	1323	1303	1453	1433
24	8	D	21	33	21	1697	1664	1863	1830
24	10	B	21	33	21	1341	1321	1489	1469
24	10	D	21	33	21	1732	1699	1933	1900
24	12	B	21	33	21	1362	1342	1532	1511
24	12	D	21	33	21	1768	1735	2005	1972
24	14	B	21	33	21	1402	1381	1609	1589
24	14	D	21	33	21	1810	1777	2088	2055
24	16	B	21	33	21	1443	1423	1694	1673
24	16	D	21	33	21	1858	1825	2185	2151
24	18	B	21	33	21	1460	1440	1727	1706
24	18	D	21	33	21	1885	1852	2238	2205
24	20	B	21	33	21	1474	1454	1756	1736
24	20	D	21	33	21	2025	1991	2518	2484
24	24	B	21	33	21	1523	1503	1854	1834
24	24	D	21	33	21	2146	2113	2727	2694
30	6	A	13	25	24	1272	1300	1407	1434
30	6	B	13	25	24	1433	1417	1580	1563
30	6	C	13	25	24	1683	1673	1870	1850
30	6	D	13	25	24	1934	1920	2113	2099
30	8	A	14	26	24	1318	1346	1453	1481
30	8	B	14	26	24	1482	1466	1624	1609
30	8	C	14	26	24	1765	1745	1953	1934
30	8	D	14	26	24	2004	1990	2182	2168
30	10	A	15	27	24	1369	1396	1512	1540
30	10	B	15	27	24	1538	1521	1685	1668
30	10	C	15	27	24	1857	1837	2075	2056
30	10	D	15	27	24	2108	2094	2319	2306
30	12	A	15	27	24	1395	1420	1555	1580
30	12	B	15	27	24	1555	1540	1715	1700
30	12	C	15	27	24	1911	1891	2184	2164
30	12	D	15	27	24	2154	2140	2411	2398
30	14	A	18	30	26	1547	1575	1737	1764
30	14	B	18	30	26	1805	1789	2085	2069
30	14	C	18	30	3	2159	2140	2497	2477
30	14	D	18	30	3	2567	2553	3026	3013
30	16	A	19	31	6	1648	1675	1805	1832
30	16	B	19	31	26	1899	1883	2200	2184
30	16	C	19	31	26	2272	2253	2662	2642
30	16	D	19	31	26	2692	2678	3206	3192
30	18	A	20	34	26	1757	1741	2024	2007
30	18	B	20	34	26	2044	1976	2387	2318

**ENGINEERING INSTITUTE OF CANADA**  
**STANDARD SPECIAL CASTINGS FOR WATER**  
**Table No. 10—Continued. Standard Branches**

Nominal Diam. Inches		Class	Dimensions, Inches			Approximate Weights, Pounds			
A	B		H	J	I	3-Way Branches		4-Way Branches	
						2 Bells	3 Bells	3 Bells	4 Bells
30	18	C	20	34	26	2434	2353	2862	2781
30	18	D	20	34	26	2805	2791	3361	3348
30	20	A	21	36	26	1857	1818	2157	2118
30	20	B	21	36	26	2182	2088	2584	2490
30	20	C	21	36	26	2667	2555	3237	3126
30	20	D	21	36	26	3041	2921	3657	3538
30	24	A	23	38	26	1979	1940	2312	2274
30	24	B	23	38	26	2313	2219	2742	2648
30	24	C	23	38	26	2847	2736	3474	3362
30	24	D	23	38	26	3290	3170	4014	3895
30	30	A	26	43	26	2212	2129	2602	2520
30	30	B	26	43	26	2599	2453	3106	2960
30	30	C	26	43	26	3310	3137	4110	3937
30	30	D	26	43	26	3850	3660	4799	4609
36	8	A	14	26	27	1751	1777	1938	1963
36	8	B	14	26	27	2055	2073	2268	2287
36	8	C	14	26	27	2421	2433	2679	2691
36	8	D	14	26	27	2780	2780	3038	3039
36	10	A	15	27	27	1810	1835	1996	2021
36	10	B	15	27	27	2128	2147	2345	2364
36	10	C	15	27	27	2534	2546	2822	2834
36	10	D	15	27	27	2903	2902	3188	3188
36	12	A	16	28	27	1884	1909	2084	2109
36	12	B	16	28	27	2219	2238	2458	2477
36	12	C	16	28	27	2644	2656	2962	2973
36	12	D	16	28	27	3032	3033	3349	3350
36	14	A	18	30	29	2039	2065	2279	2304
36	14	B	18	30	29	2415	2433	2709	2728
36	14	C	18	30	29	2872	2883	3251	3263
36	14	D	18	30	29	3470	3470	4033	4033
36	16	A	19	31	29	2135	2160	2410	2436
36	16	B	19	31	29	2521	2540	2853	2872
36	16	C	19	31	29	3003	3014	3431	3442
36	16	D	19	31	29	3618	3617	4231	4230
36	18	A	20	34	29	2279	2246	2581	2548
36	18	B	20	34	29	2701	2650	3073	3022
36	18	C	20	34	29	3206	3136	3673	3604
36	18	D	20	34	29	3852	3755	4506	4409
36	20	A	21	36	29	2409	2346	2752	2689
36	20	B	21	36	29	2885	2800	3336	3251
36	20	C	21	36	29	3537	3426	4212	4101
36	20	D	21	36	29	4050	3905	4757	4612
36	24	A	23	38	29	2451	2513	2844	2907
36	24	B	23	38	29	3099	3014	3624	3539
36	24	C	23	38	29	3806	3695	4585	4474

**ENGINEERING INSTITUTE OF CANADA  
STANDARD SPECIAL CASTINGS FOR WATER  
Table No. 10—Continued. Standard Branches**

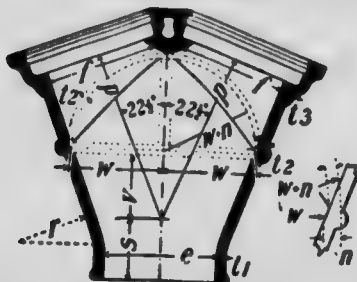
Nominal Diam. Inches		Class	Dimensions, Inches			Approximate Weights, Pounds			
A	B		H	J	I	3-Way Branches		4-Way Branches	
						2 Bells	3 Bells	3 Bells	4 Bells
36	24	D	23	38	29	4511	4366	5307	5161
36	30	A	26	43	29	2830	2708	3242	3120
36	30	B	26	43	29	3594	3438	4335	4179
36	30	C	26	43	29	4248	4055	5140	4947
36	30	D	26	43	29	5160	4918	6192	5950
36	36	A	29	46	29	3067	2946	3539	3418
36	36	B	29	46	29	4046	3891	4956	4800
36	36	C	29	46	29	4788	4595	5867	5673
42	12	D	29	46	29	5810	5567	7099	6857
42	12	A	16	28	30	2507	2577	3467	3537
42	12	B	16	28	30	2670	2889	3131	3170
42	12	C	16	28	30	3478	3507	3830	3860
42	12	D	16	28	30	3971	3989	4307	4325
42	14	A	18	30	32	2651	2739	2942	3010
42	14	B	18	30	32	3075	3114	3400	3440
42	14	C	18	30	32	3747	3776	4147	4177
42	14	D	18	30	32	4590	4609	5288	5306
42	16	A	19	31	32	2778	2846	3080	3148
42	16	B	19	31	32	3196	3235	3552	3592
42	16	C	19	31	32	3891	3920	4325	4354
42	16	D	19	31	32	4754	4772	5487	5506
42	18	A	20	34	32	2950	2941	3268	3258
42	18	B	20	34	32	3407	3357	3794	3744
42	18	C	20	34	32	4393	4312	5108	5028
42	18	D	20	34	32	5049	4939	5819	5709
42	20	A	21	36	32	3104	3056	3459	3411
42	20	B	21	36	32	3582	3486	4009	3913
42	20	C	21	36	32	4615	4479	5387	5251
42	20	D	21	36	32	5297	5123	6122	5948
42	24	A	23	38	32	3314	3266	3724	3676
42	24	B	23	38	32	3852	3756	4370	4274
42	24	C	23	38	32	4965	4829	5866	5730
42	24	D	23	38	32	5709	5535	6579	6405
42	30	A	26	43	32	3679	3553	4144	4018
42	30	B	26	43	32	4554	4370	5416	5230
42	30	C	26	43	32	5649	5402	6675	6428
42	30	D	26	43	32	6561	6258	7729	7426
42	36	A	29	46	32	4076	3950	4705	4579
42	36	B	29	46	32	4903	4718	5845	5659
42	36	C	29	46	32	6150	5901	7261	7015
42	36	D	29	46	32	7187	6884	8512	8209
42	42	A	32	49	32	4393	4267	5109	4983
42	42	B	32	49	32	5533	5348	6641	6455
42	42	C	32	49	32	7001	6755	8392	8146
42	42	D	32	49	32	8158	7855	9803	9500

# ENGINEERING INSTITUTE OF CANADA STANDARD SPECIAL CASTINGS FOR WATER

Table No. 10—Continued.    Standard Branches

Nominal Diam. Inches		Class	Dimensions, Inches			Approximate Weights, Pounds			
A	B		H	J	I	3-Way Branches		4-Way Branches	
						2 Bells	3 Bells	3 Bells	4 Bells
48	12	A	17	29	33	3266	3319	3653	3707
48	12	B	17	29	33	3752	3804	4107	4160
48	12	C	17	29	33	4510	4576	4940	5007
48	12	D	17	29	33	5564	5624	6376	6436
48	14	A	18	30	35	3422	3476	3762	3815
48	14	B	18	30	35	4173	4226	4836	4889
48	14	C	18	30	35	4965	5030	5712	5778
48	14	D	18	30	35	5754	5815	6596	6656
48	16	A	19	31	35	3565	3619	3947	4001
48	16	B	19	31	35	4046	4098	4466	4519
48	16	C	19	31	35	5055	5121	5755	5821
48	16	D	19	31	35	5967	6028	6860	6921
48	18	A	20	34	35	5775	5829	6596	6656
48	18	B	20	34	35	4287	4341	4718	4778
48	18	C	20	34	35	5479	5540	6328	6388
48	18	D	20	34	35	6328	6389	7259	7319
48	20	A	21	36	35	3956	3980	4378	4432
48	20	B	21	36	35	4500	4560	4973	5033
48	20	C	21	36	35	5745	5804	6652	6711
48	20	D	21	36	35	6607	6665	7574	7632
48	24	A	23	38	35	4221	4280	4706	4765
48	24	B	23	38	35	5028	5087	5798	5857
48	24	C	23	38	35	6193	6252	7272	7331
48	24	D	23	38	35	7064	7123	7994	8053
48	30	A	26	43	35	4748	4807	5361	5420
48	30	B	26	43	35	5685	5744	6418	6477
48	30	C	26	43	35	7042	7101	8265	8324
48	30	D	26	43	35	8051	8110	9303	9362
48	36	A	29	46	35	5150	5209	5859	5918
48	36	B	29	46	35	6322	6381	7382	7441
48	36	C	29	46	35	7603	7662	8915	8974
48	36	D	29	46	35	8830	8889	10336	10395
48	42	A	32	49	35	5503	5562	6266	6325
48	42	B	32	49	35	6821	6880	7973	8032
48	42	C	32	49	35	8278	8337	9750	9809
48	42	D	32	49	35	9644	9703	11367	11426
48	48	A	35	52	35	6043	6102	7043	7102
48	48	B	35	52	35	7659	7718	9076	9135
48	48	C	35	52	35	9229	9288	11006	11065
48	48	D	35	52	35				

# ENGINEERING INSTITUTE OF CANADA STANDARD SPECIAL CASTINGS FOR WATER



Standard  
Y Branches,  
Type 1

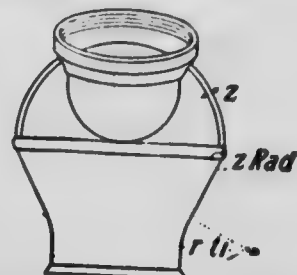


Table No. 11

Nominal Diam., Inch.		Class	s	p	v	w	n	r	Thickness, Inches			Approx. Weight Pounds
e	f								t1	t2	t3	
12	12	D	16 00	21.50	8.00	9 79	1.17	30	.75	1.08	.75	687
14	14	D	16 00	24 00	9 00	11 30	1.08	30	.66	.99	.66	738
14	14	D	16 00	24 00	9 00	11 30	1.32	30	.82	1.22	.82	894
16	16	D	17 00	27 50	10.50	13 00	1.12	30	.70	1.03	.70	942
16	16	D	17 00	27 50	10 50	13 00	1.39	30	.89	1.29	.89	1275
18	18	D	18 00	30 00	12 00	14 70	1.17	30	.75	1.08	.75	1266
18	18	D	18 00	30 00	12 00	14 70	1.46	30	.97	1.36	.96	1607
20	20	B	18 00	34 00	13.50	16 40	1.26	30	.80	1.16	.80	1635
20	20	D	18 00	34 00	13.50	16 40	1.57	30	1.03	1.46	1 03	2296
24	20	D	12 00	34 00	13 50	16 40	1.26	30	.89	1 16	.80	1663
24	20	D	12 00	34 00	13 50	16 40	1 57	30	1.16	1.46	1 03	2393
24	24	D	18 00	38 00	15 25	19 30	1.36	30	.89	1 26	.89	2300
24	24	B	18 00	38 00	15 25	19 30	1 75	30	1.16	1 63	1 16	2957
30	24	A	12 00	38 00	15 25	19 30	1 36	30	.88	1 26	.89	2171
30	24	A	12 00	38 00	15 25	19 30	1 36	30	1.03	1 26	.89	2217
30	24	C	12 00	38 00	15 25	19 30	1 75	30	1.20	1 63	1 16	2717
30	24	D	12 00	38 00	15 25	19 30	1 75	30	1.37	1 63	1 16	2811
30	30	D	18 00	49 00	18 00	23 70	1 32	30	.88	1 22	.88	3158
30	30	A	18 00	48 00	18 00	23 70	1 59	30	1 03	1 47	1 03	3687
30	30	B	18 00	48 00	18 00	23 70	1 88	30	1 20	1 74	1 20	4285
30	30	C	18 00	48 00	18 00	23 70	2 17	30	1 37	2 01	1 37	4941
36	30	A	10 00	48 00	18 00	23 70	1 32	30	.99	1 22	.88	3343
36	30	B	19 00	48 00	18 00	23 70	1 59	30	1 15	1 47	1 03	3874
36	30	C	10 00	48 00	18 00	23 70	1 88	30	1 36	1 74	1 20	4486
36	30	D	10 00	48 00	18 00	23 70	2 17	30	1 58	2 01	1 37	5189
36	30	A	18 00	56 00	21 00	28 20	1 50	24	.99	1 39	.99	4949
36	36	A	18 00	56 00	21 00	28 20	1 79	24	1 15	1 66	1 15	5858
36	36	B	18 00	56 00	21 00	28 20	2 13	24	1 36	1 98	1 36	6804
42	30	C	18 00	56 00	21 00	28 20	2 48	24	1 58	2 31	1 58	8025
42	30	A	6 00	48 00	18 00	23 70	1 32	30	1 10	1 22	.88	3168
42	30	B	6 00	48 00	18 00	23 70	1 59	30	1 28	1 47	1 03	3590
42	30	C	6 00	48 00	18 00	23 70	1 88	30	1 54	1 74	1 20	4543
42	30	D	00	48 00	18 00	23 70	2 17	30	1 78	2 01	1 37	5241
42	36	A	10 00	56 00	21 00	28 20	1 50	24	1 10	1 39	.99	4904
42	36	B	10 00	56 00	21 00	28 20	1 79	24	1 28	1 66	1 15	5789
42	36	C	10 00	56 00	21 00	28 20	2 13	24	1 54	1 98	1 36	6761
42	36	D	10 00	56 00	21 00	28 20	2 48	24	1 78	2 31	1 58	8025
42	42	A	18 00	66 00	25 00	33 10	1 72	21	1 10	1 60	1 10	7394
42	42	B	18 00	66 00	25 00	33 10	2 05	24	1 28	1 90	1 28	8417
42	42	C	18 00	66 00	25 00	33 10	2 46	24	1 54	2 28	1 54	10377
42	42	D	18 00	66 00	25 00	33 10	2 85	24	1 78	2 64	1 78	12072
48	36	A	2 00	56 00	21 00	28 20	1 50	24	1 26	1 39	.99	4727
48	36	B	2 00	56 00	21 00	28 20	1 79	24	1 42	1 66	1 15	5584
48	36	C	2 00	56 00	21 00	28 20	2 13	24	1 71	1 98	1 36	6494
48	42	D	2 00	56 00	21 00	28 20	2 48	24	1 96	2 31	1 58	7731
48	42	A	10 00	66 00	25 00	33 10	1 72	24	1 26	1 60	1 10	7345
48	42	B	10 00	66 00	25 00	33 10	2 05	24	1 42	1 90	1 28	8338
48	42	C	10 00	66 00	25 00	33 10	2 46	24	1 71	2 28	1 54	10249
48	42	D	10 00	66 00	25 00	33 10	2 85	24	1 96	2 64	1 78	11924
48	48	A	18 00	76 00	28 00	37 60	1 99	24	1 26	1 86	1 26	10200
48	48	B	18 00	76 00	28 00	37 60	2 32	24	1 42	2 15	1 42	12132
48	48	C	18 00	76 00	28 00	37 60	2 78	24	1 71	2 57	1 71	14716
48	48	D	18 00	76 00	28 00	37 60	3 20	24	1 96	2 95	1 96	14965

# ENGINEERING INSTITUTE OF CANADA STANDARD SPECIAL CASTINGS FOR WATER

## Y Branches, Type 2

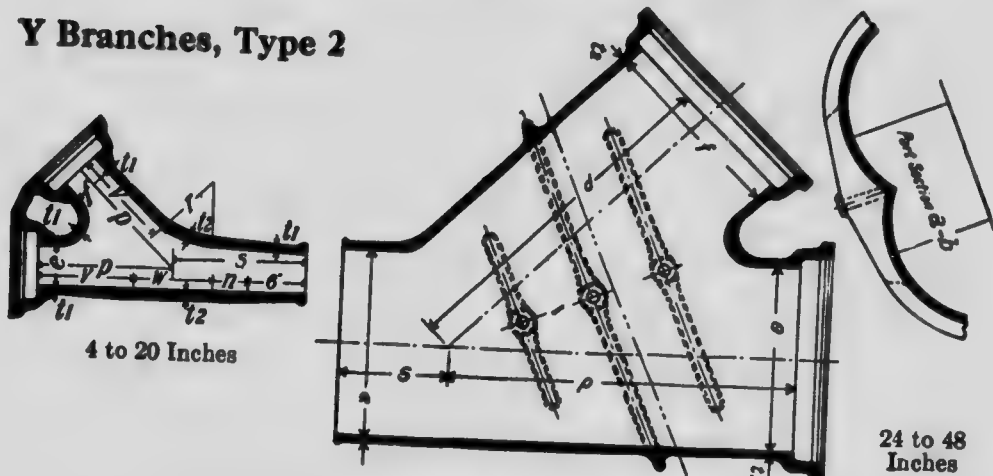
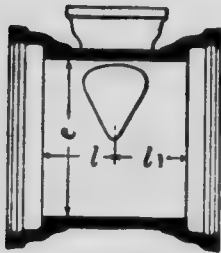


Table No. 12

Nominal Diam., Inch.		Class	s	p	v	w	n	r	Thickness Inches		Approx. Weight Pounds
e	f								t1	t2	
4	4	D	11.50	10.50	7.18	6.64	2.18	6	.52	.64	103
6	6	D	13.00	13.00	9.27	7.46	3.27	6	.55	.67	181
8	8	D	14.00	16.00	11.85	8.30	3.85	6	.60	.72	291
10	10	D	15.50	18.50	13.94	9.12	4.94	6	.68	.83	434
12	12	D	16.50	21.50	16.54	9.92	4.54	6	.75	.93	632
14	14	B	16.00	24.00	18.62	10.76	4.62	6	.66	.84	690
14	14	D	16.00	24.00	18.62	10.76	4.62	6	.82	1.00	985
16	16	B	17.50	31.00	25.20	11.60	5.70	6	.70	1.03	967
16	16	D	17.50	31.00	25.20	11.60	5.70	6	.89	1.29	1413
18	18	B	18.00	34.00	28.00	12.00	6.00	6	.75	1.12	1358
18	18	D	18.00	34.00	28.00	12.00	6.00	6	.96	1.44	1737
20	20	B	18.75	37.00	30.75	12.50	6.50	6	.80	1.20	1725
20	20	D	18.75	37.00	30.75	12.50	6.50	6	1.03	1.50	2199
24	20	B	18.75	40.00	.....	.....	.....	6	.89	.80	2203
24	20	D	18.75	40.00	.....	.....	.....	6	1.16	1.03	3087
24	24	B	19.75	42.00	.....	.....	.....	6	.89	.89	2600
24	24	D	19.75	42.00	.....	.....	.....	6	1.16	1.16	3599
30	24	A	17.00	49.50	.....	.....	.....	6	.88	.89	3178
30	24	B	17.00	49.50	.....	.....	.....	6	1.03	.89	3874
30	30	A	22.75	52.50	.....	.....	.....	6	.88	.88	3519
30	30	B	22.75	52.50	.....	.....	.....	6	1.03	1.03	4360
36	30	A	19.75	56.00	.....	.....	.....	6	.99	.88	4338
36	30	B	19.75	56.00	.....	.....	.....	6	1.15	1.03	4425
36	36	A	24.00	60.00	.....	.....	.....	6	.99	.99	4951
36	36	B	24.00	60.00	.....	.....	.....	6	1.15	1.15	6509
42	30	A	16.75	63.00	.....	.....	.....	6	1.10	.88	5543
42	30	B	16.75	63.00	.....	.....	.....	6	1.28	1.03	6782
42	36	A	21.00	66.00	.....	.....	.....	6	1.10	.99	6446
42	36	B	21.00	66.00	.....	.....	.....	6	1.28	1.15	7895
42	42	A	25.25	69.00	.....	.....	.....	6	1.10	1.10	7591
42	42	B	25.25	69.00	.....	.....	.....	6	1.28	1.28	9163
48	36	A	18.00	71.00	.....	.....	.....	6	1.26	.99	7850
48	36	B	18.00	71.00	.....	.....	.....	6	1.42	1.15	9500
48	42	A	22.25	74.00	.....	.....	.....	6	1.26	1.10	9116
48	42	B	22.25	74.00	.....	.....	.....	6	1.42	1.28	10887
48	48	A	26.50	77.00	.....	.....	.....	6	1.26	1.26	10599
48	48	B	26.50	77.00	.....	.....	.....	6	1.42	1.42	12554

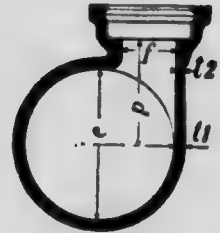


# ENGINEERING INSTITUTE OF CANADA STANDARD SPECIAL CASTINGS FOR WATER



## Standard Blow-off Branches

Table No. 13



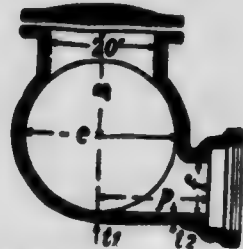
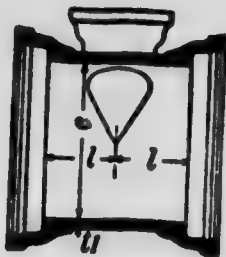
Nominal Diameter Inches		Class	l	p	Thickness Inches		Approx Weight Pounds	Nominal Diam. Inches		Class	l	p	Thickness Inches		Approx Weight Pounds
e	f				t1	t2		e	f				t1	t2	
8	4	D	12	7	.60	.52	227	36	12	A	13	23	.99	.75	1702
10	4	D	12	8	.68	.52	286	36	12	B	13	23	1.15	.75	1972
10	6	D	12	8	.68	.55	300	36	12	C	13	23	1.36	.75	2285
12	4	D	12	10	.75	.52	365	36	12	D	13	23	1.58	.75	2627
12	6	D	12	10	.75	.55	379	42	12	A	15	26	1.10	.75	2432
14	4	B	12	11	.66	.52	400	42	12	B	15	26	1.28	.75	2728
14	4	D	12	11	.82	.52	471	42	12	C	15	26	1.54	.75	3271
14	6	B	12	11	.66	.55	415	42	12	D	15	26	1.78	.75	3768
14	6	D	12	11	.82	.55	486	42	16	A	15	26	1.10	.70	2489
16	4	B	12	12	.70	.52	497	42	16	B	15	26	1.28	.70	2786
16	4	D	12	12	.89	.52	597	42	16	C	15	26	1.54	.89	3365
16	6	B	12	12	.70	.55	513	42	16	D	15	26	1.78	.89	3862
16	6	D	12	12	.89	.55	613	48	12	A	17	30	1.26	.75	3274
18	4	B	12	13	.75	.52	586	48	12	B	17	30	1.42	.75	3699
18	4	D	12	13	.96	.52	704	48	12	C	17	30	1.71	.75	4417
18	6	B	12	13	.75	.55	603	48	12	D	17	30	1.96	.75	5107
18	6	D	12	13	.96	.55	720	48	16	A	17	30	1.26	.70	3337
20	4	B	12	14	.80	.52	687	48	16	B	17	30	1.42	.70	3762
20	4	D	12	14	1.03	.52	850	48	16	C	17	30	1.71	.89	4523
20	6	B	12	14	.80	.55	705	48	16	D	17	30	1.96	.89	5214
20	6	D	12	14	1.03	.55	867	54	12	A	19	33	1.35	.75	4287
24	6	B	12	16	.89	.55	916	54	12	B	19	33	1.55	.75	4915
24	6	D	12	16	1.16	.55	1149	54	12	C	19	33	1.90	.75	5981
24	8	B	12	16	.89	.60	935	54	12	D	19	33	2.23	.75	7002
24	8	D	12	16	1.16	.60	1170	54	16	A	19	33	1.35	.70	4355
30	8	A	13	20	.88	.60	1269	54	16	B	19	33	1.55	.70	5013
30	8	B	13	20	1.03	.60	1382	54	16	C	19	33	1.90	.89	6096
30	8	C	13	20	1.20	.60	1616	54	16	D	19	33	2.23	.89	7126
30	8	D	13	20	1.37	.60	1867	60	12	A	21	36	1.39	.75	5263
30	12	A	13	20	.88	.75	1315	60	12	B	21	36	1.67	.75	6159
30	12	B	13	20	1.03	.75	1426	60	12	C	21	36	2.00	.75	7418
30	12	C	13	20	1.20	.75	1658	60	12	D	21	36	2.38	.75	8798
30	12	D	13	20	1.37	.75	1913	60	16	A	21	36	1.39	.70	5336
36	8	A	13	23	.99	.60	1653	60	16	B	21	36	1.67	.70	6233
36	8	P	13	23	1.15	.60	1922	60	16	C	21	36	2.00	.89	7542
36	8	C	13	23	1.36	.60	2234	60	16	D	21	36	2.38	.89	8927
36	8	D	13	23	1.58	.60	2576								

# ENGINEERING INSTITUTE OF CANADA STANDARD SPECIAL CASTINGS FOR WATER

## Standard Blow-off Branches with Manhole

Table No. 14

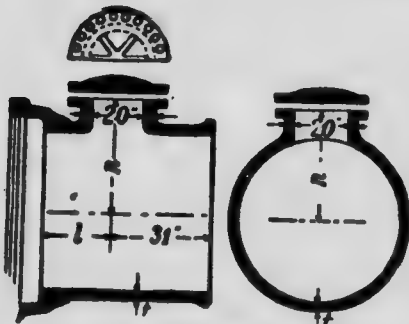
Approximate Weight of Cap  
290 Pounds



Nominal Diam. Inches		Class	l	p	n	Thickness Inches		Approximate Weight, Lbs.	Nom'l Diam. Inches		Class	l	p	n	Thickness Inches		Approximate Weight, Lbs.
e	f					t1	t2		e	f					t1	t2	
30	8	A	17	20	21	.88	.60	1628	48	12	A	17	30	30	1.26	.75	3391
30	8	B	17	20	21	1.03	.60	1758	48	12	B	17	30	30	1.42	.75	3803
30	8	C	17	20	21	1.20	.60	2015	48	12	C	17	30	30	1.71	.75	4497
30	8	D	17	20	21	1.37	.60	2290	48	12	D	17	30	30	1.96	.75	5167
30	12	A	17	20	21	.88	.75	1672	48	16	A	17	30	30	1.26	.70	3454
30	12	B	17	20	21	1.03	.75	1803	48	16	B	17	30	30	1.42	.70	3866
30	12	C	17	20	21	1.20	.75	2037	48	16	C	17	30	30	1.71	.70	4604
30	12	D	17	20	21	1.37	.75	2335	48	16	D	17	30	30	1.96	.70	5274
36	8	A	17	23	24	.99	.60	2045	54	12	A	19	33	33	1.35	.75	4390
36	8	B	17	23	24	1.15	.60	2351	54	12	B	19	33	33	1.55	.75	5032
36	8	C	17	23	24	1.36	.60	2600	54	12	C	19	33	33	1.90	.75	6039
36	8	D	17	23	24	.99	.75	2094	54	16	A	19	33	33	1.35	.70	4458
36	12	A	17	23	24	1.15	.75	2395	54	16	B	19	33	33	1.55	.70	5100
36	12	B	17	23	24	1.36	.75	2741	54	16	C	19	33	33	1.90	.70	6154
42	12	A	17	26	27	1.10	.75	3122	60	12	A	21	36	36	1.39	.75	5357
42	12	B	17	26	27	1.28	.75	3433	60	12	B	21	36	36	1.67	.75	6230
42	12	C	17	26	27	1.54	.75	3955	60	12	C	21	36	36	2.00	.75	7462
42	16	A	17	26	27	1.10	.70	4109	60	16	A	21	36	36	1.39	.70	5810
42	16	B	17	26	27	1.28	.70	4783	60	16	B	21	36	36	1.67	.70	6720
42	16	C	17	26	27	1.54	.89	5445	60	16	C	21	36	36	2.00	.89	7587
48	16	D	17	26	27	1.78	.89	6203	60	16	D	21	36	36	2.38	.89	8939

## STANDARD MANHOLE PIPE

Table No. 15

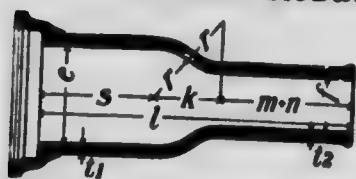


Standard Manhole Pipe  
Approximate Weight of Cap, 290 Pounds

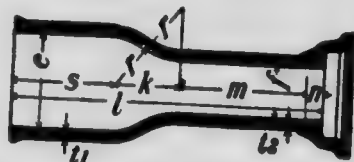
Nom'l Diam. Inches	Class	n	t	Weight Pounds	Nom'l Diam. Inches	Class	n	t	Weight Pounds
30	A	21	.88	1536	48	A	30	1.26	3194
30	B	21	1.03	1711	48	B	30	1.42	3610
30	C	21	1.20	1973	48	C	30	1.71	4292
30	D	21	1.37	2245	48	D	30	1.96	4968
36	A	24	.99	1953	54	A	33	1.35	4006
36	B	24	1.15	2260	54	B	33	1.55	4598
36	C	24	1.36	2614	54	C	33	1.90	5578
36	D	24	1.58	3012	54	D	33	2.23	6522
42	A	27	1.10	2535	60	A	36	1.39	4750
42	B	27	1.28	2869	60	B	36	1.67	5606
42	C	27	1.54	3445	60	C	36	2.00	6720
42	D	27	1.78	3971	60	D	36	2.38	7959

l = 17 Inches on 30 inches to 48 inches; 19 inches on 54 inches, 21 inches on 60 inches diameter.

**ENGINEERING INSTITUTE OF CANADA  
STANDARD SPECIAL CASTINGS FOR WATER  
Standard Reducers and Increaseers, Type No. 1**



**Table No. 16**

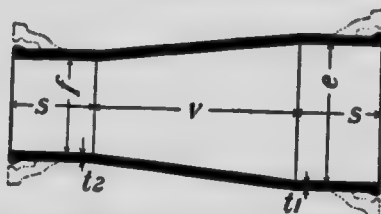


Diam. Inches		k	m	r	Thickness, Inches		Weights, Pounds	
e	f				t1	t2	Large End Bell	Small End Bell
6	4	3.30	14.70	3	.55	.52	99	88
8	4	5.30	12.70	4	.60	.52	131	103
8	6	3.90	14.10	4	.60	.55	149	138
10	4	7.10	10.90	5	.68	.52	164	132
10	6	6.00	12.00	5	.68	.55	181	160
10	8	4.40	13.60	5	.68	.60	205	195
12	6	7.90	10.10	6	.75	.55	225	191
12	8	6.60	11.40	6	.75	.60	246	224
12	10	4.80	13.20	6	.75	.68	271	260

Class D. 6 x 4 inches to 12 x 10 inches. On all sizes n = 2 inches.  
On all sizes l = 30 inches and s = 10 inches.

**STANDARD REDUCERS AND INCREASEERS**

**Table No. 17**



**Type No. 2**

6 x 4 inches to  
60 x 54 inches

Nominal Diam. Inches		v	Thickness, Inches		Class	Weights, Pounds		
e	f		t1	t2		Spigot Ends	Large End Bell	Small End Bell
6	4	18	.55	.52	D	82	104	97
8	4	18	.60	.52	D	104	132	119
8	6	18	.60	.55	D	121	150	143
10	4	18	.68	.52	D	131	162	146
10	6	18	.68	.55	D	150	180	169
10	8	18	.68	.60	D	170	201	193
12	4	18	.75	.52	D	163	201	179
12	6	18	.75	.55	D	181	218	202
12	8	18	.75	.60	D	202	240	231
12	10	18	.75	.68	D	229	267	261
14	6	20	.66	.55	P	194	249	216
14	8	20	.82	.55	D	234	288	256
14	8	20	.66	.60	B	220	275	248
14	8	20	.82	.60	D	260	314	288

On all sizes s = 8 inches.

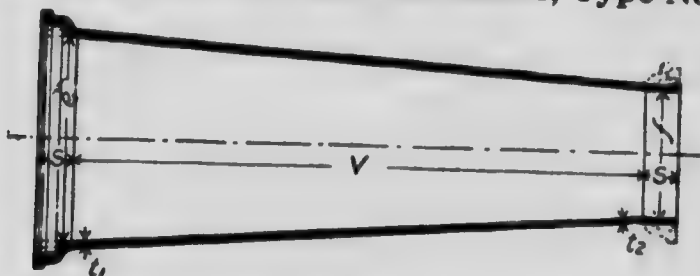
**ENGINEERING INSTITUTE OF CANADA  
STANDARD SPECIAL CASTINGS FOR WATER  
Standard Reducers and Increaseers, Type No. 2**

**Table No. 17—Continued**

Nominal Diam. Inches		v	Thickness, Inches		Class	Weights, Pounds		
e	f		t1	t2		Spigot Ends	Large End Bell	Small End Bell
14	10	20	.66	.68	B	250	305	279
14	10	20	.82	.68	D	290	344	320
14	12	20	.66	.75	B	284	339	321
14	12	20	.82	.75	D	324	378	360
16	6	20	.70	.55	B	226	300	248
16	6	20	.89	.55	D	278	355	300
16	8	20	.70	.60	B	252	326	280
16	8	20	.89	.60	D	304	381	332
16	10	20	.70	.68	B	282	356	312
16	10	20	.89	.68	D	334	410	364
16	12	20	.70	.75	B	317	391	353
16	12	20	.89	.75	D	368	445	405
16	14	20	.70	.66	B	315	389	370
16	14	20	.89	.82	D	407	484	461
18	8	20	.75	.60	B	287	374	315
18	8	20	.96	.60	D	345	438	373
18	10	20	.75	.68	B	317	404	347
18	10	20	.96	.68	D	375	468	405
18	12	20	.75	.75	B	352	438	388
18	12	20	.96	.75	D	410	502	446
18	14	20	.75	.66	B	350	437	406
18	14	20	.96	.82	D	448	541	502
18	16	20	.75	.70	B	383	469	457
18	16	20	.96	.80	D	492	585	569
20	10	26	.80	.68	B	414	516	445
20	10	26	1.03	.68	D	499	615	529
20	12	26	.80	.75	B	455	556	491
20	12	26	1.03	.75	D	539	656	576
20	14	26	.80	.66	B	453	554	508
20	14	26	1.03	.82	D	583	700	638
20	16	26	.80	.70	B	490	592	564
20	16	26	1.03	.89	D	635	751	711
20	18	26	.80	.75	B	531	633	617
20	18	26	1.03	.96	D	683	800	776
24	14	26	.89	.66	B	552	680	607
24	14	26	1.16	.82	D	710	866	764
24	16	26	.89	.70	B	589	717	663
24	16	26	1.16	.89	D	762	917	838
24	18	26	.89	.75	B	630	758	717
24	18	26	1.16	.96	D	810	965	901
24	20	26	.89	.80	B	675	803	776
24	20	26	1.16	1.03	D	871	1027	987
30	18	26	.88	.75	A	710	903	796
30	18	26	1.03	.75	B	791	969	878
30	18	26	1.20	.96	C	956	1166	1048
30	18	26	1.37	.96	D	1054	1305	1146
30	20	26	.88	.80	A	754	947	856

On all sizes s = 8 inches.

**ENGINEERING INSTITUTE OF CANADA  
STANDARD SPECIAL CASTINGS FOR WATER  
Standard Reducers and Increases, Type No. 2**



Long Reducer. 48 to 80 inches x 132 inches v

**Table No. 17—Continued**

Nominal Diam. Inches		v	Thickness, Inches		Class	Weights, Pounds		
e	f		t1	t2		Spigot Ends	Large End Bell	Small End Bell
30	20	26	1.03	.80	B	836	1014	937
30	20	26	1.20	1.03	C	1018	1227	1134
30	20	26	1.37	1.03	D	1115	1366	1232
30	20	66	.88	.80	A	1468	1661	1569
30	20	66	1.03	.80	B	1626	1804	1728
30	20	66	1.20	1.03	C	1981	2190	2098
30	20	66	1.37	1.03	D	2172	2423	2289
30	24	26	.88	.89	A	854	1047	981
30	24	26	1.03	.89	B	935	1113	1063
30	24	26	1.20	1.16	C	1144	1354	1300
30	24	26	1.37	1.16	D	1242	1493	1398
30	24	66	.88	.89	A	1661	1921	1869
30	24	66	1.03	.89	B	1820	1998	1946
30	24	66	1.20	1.16	C	2228	2438	2384
30	24	66	1.37	1.16	D	2419	2670	2575
36	20	32	.99	.80	A	1039	1286	1141
36	20	32	1.15	.80	B	1170	1450	1272
36	20	32	1.36	1.03	C	1417	1739	1534
36	20	32	1.58	1.03	D	1589	1951	1705
36	20	66	.99	.80	A	1771	2018	1872
36	20	66	1.15	.80	B	1994	2274	2095
36	20	66	1.36	1.03	C	2416	2738	2533
36	20	66	1.58	1.03	D	2710	3072	2827
36	24	32	.99	.89	A	1158	1339	1280
36	24	32	1.15	.89	B	1283	1564	1411
36	24	32	1.36	1.16	C	1562	1884	1718
36	24	32	1.58	1.16	D	1734	2096	1890
36	24	66	.99	.89	A	1964	2211	2091
36	24	66	1.15	.89	B	2188	2468	2314
36	24	66	1.36	1.16	C	2664	2985	2820
36	24	66	1.58	1.16	D	2957	3319	3113
36	30	32	.99	.88	A	1243	1490	1436
36	30	32	1.15	1.03	B	1467	1747	1645
36	30	32	1.36	1.20	C	1730	2051	1939
36	30	32	1.58	1.37	D	2013	2375	2264

On all sizes s = 8 inches.

**ENGINEERING INSTITUTE OF CANADA  
STANDARD SPECIAL CASTINGS FOR WATER  
Standard Reducers and Increasesrs, Type No. 2**

**Table No. 17—Continued**

Nominal Diam. Inches		v	Thickness, Inches		Class	Weights, Pounds		
e	f		t1	t2		Spigot Ends	Large End Bell	Small End Bell
36	30	66	.99	.89	A	2119	2366	2312
36	30	66	1.15	1.03	B	2502	2783	2680
36	30	66	1.36	1.20	C	2950	3271	3159
36	30	66	1.58	1.37	D	3434	3796	3684
42	20	32	1.10	.80	A	1262	1602	1364
42	20	32	1.28	.80	B	1413	1768	1515
42	20	32	1.54	1.03	C	1753	2168	1869
42	20	32	1.78	1.03	D	1975	2445	2092
42	20	66	1.10	.80	A	2152	2491	2254
42	20	66	1.28	.80	B	2410	2764	2511
42	20	66	1.54	1.03	C	2969	3405	3106
42	20	66	1.78	1.03	D	3369	3839	3486
42	24	32	1.10	.89	A	1376	1715	1504
42	24	32	1.28	.89	B	1527	1881	1654
42	24	32	1.54	1.16	C	1896	2313	2053
42	24	32	1.78	1.16	D	2120	2590	2276
42	24	66	1.10	.89	A	2346	2685	2472
42	24	66	1.28	.89	B	2603	2958	2730
42	24	66	1.54	1.16	C	3237	3652	3392
42	24	66	1.78	1.16	D	3616	4086	3772
42	30	32	1.10	.88	A	1467	1806	1660
42	30	32	1.28	1.03	B	1711	2065	1889
42	30	32	1.54	1.20	C	2065	2480	2275
42	30	32	1.78	1.37	D	2399	2869	2650
42	30	66	1.10	.88	A	2500	2839	2693
42	30	66	1.28	1.03	B	2917	3271	3095
42	30	66	1.54	1.20	C	3523	3938	3732
42	30	66	1.78	1.37	D	4093	4563	4344
42	36	32	1.10	.99	A	1645	1984	1891
42	36	32	1.28	1.15	B	1926	2281	2207
42	36	32	1.54	1.36	C	2320	2735	2642
42	36	32	1.78	1.58	D	2714	3184	3076
42	36	66	1.10	.99	A	2803	3143	3050
42	36	66	1.28	1.15	B	3285	3639	3565
42	36	66	1.54	1.36	C	3958	4373	4279
42	36	66	1.78	1.58	D	4631	5107	4993
48	30	66	1.26	.88	A	2975	3381	3168
48	30	66	1.42	1.03	B	3428	3883	3606
48	30	66	1.71	1.20	C	4092	4641	4801
48	30	66	1.96	1.37	D	4762	5388	5013
48	30	132	1.26	.88	A	5363	5769	5556
48	30	132	1.42	1.03	B	6180	6635	6359
48	30	132	1.71	1.20	C	7379	7928	7588
48	30	132	1.96	1.37	D	8588	9214	8839
48	36	66	1.26	.99	A	3278	3684	3525
48	36	66	1.42	1.15	B	3796	4252	4077
48	36	66	1.71	1.36	C	4527	5076	4849

On all sizes s = 8 inches.



**ENGINEERING INSTITUTE OF CANADA  
STANDARD SPECIAL CASTINGS FOR WATER  
Standard Reducers and Increaseers, Type No. 2**

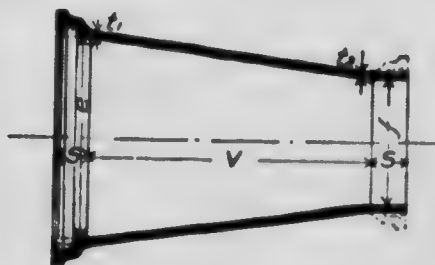
**Table No. 17—Continued**

Nominal Diam. Inches		v	Thickness, Inches		Class	Weights, Pounds		
e	f		t1	t2		Spigot Ends	Large End Bell	Small End Bell
48	36	66	1.96	1.58	D	5300	5925	5662
48	36	132	1.26	.99	A	5909	6316	6156
48	36	132	1.42	1.15	B	6444	7299	7125
48	36	132	1.71	1.36	C	8164	8713	8485
48	36	132	1.96	1.58	D	9558	10184	9920
48	42	66	1.26	1.10	A	3659	4006	3998
48	42	66	1.42	1.28	B	4212	4607	4584
48	42	66	1.71	1.54	C	5100	5649	5516
48	42	66	1.96	1.78	D	5959	6585	6429
48	42	132	1.26	1.10	A	6597	7003	6936
48	42	132	1.42	1.28	B	7594	8049	7948
48	42	132	1.71	1.54	C	9197	9746	9612
48	42	132	1.96	1.78	D	10747	11373	11217
54	36	66	1.35	.99	A	3722	4228	3969
54	36	66	1.55	1.15	B	4330	4925	4610
54	36	66	1.90	1.36	C	5259	5953	5580
54	36	66	2.23	1.58	D	6181	6995	6543
54	36	132	1.35	.99	A	6710	7216	6957
54	36	132	1.55	1.15	B	7806	8401	8087
54	36	132	1.90	1.36	C	9484	10178	9805
54	36	132	2.23	1.58	D	11148	11962	11510
54	42	66	1.35	1.10	A	4103	4609	4442
54	42	66	1.55	1.28	B	4745	5340	5100
54	42	66	1.90	1.54	C	5832	6526	6247
54	42	66	2.23	1.78	D	6841	7655	7310
54	42	132	1.35	1.10	A	7398	7903	7737
54	42	132	1.55	1.28	B	8556	9151	8910
54	42	132	1.90	1.54	C	10517	11211	10932
54	42	132	2.23	1.78	D	12338	13152	12807
54	48	66	1.35	1.26	A	4578	5083	4984
54	48	66	1.55	1.42	B	5256	5851	5711
54	48	66	1.90	1.71	C	6401	7095	6950
54	48	66	2.23	1.96	D	7512	8326	8137
54	48	132	1.35	1.26	A	8253	8759	8660
54	48	132	1.55	1.42	B	9478	10073	9933
54	48	132	1.90	1.71	C	11544	12239	12093
54	48	132	2.23	1.96	D	13550	14364	14175
60	36	66	1.39	.99	A	4096	4711	4342
60	36	66	1.67	1.15	B	4906	5576	5186
60	36	66	2.00	1.36	C	5867	6692	6189
60	36	66	2.38	1.58	D	6960	7934	7322
60	36	132	1.39	.99	A	7384	7999	7631
60	36	132	1.67	1.15	B	8846	9516	9126
60	36	132	2.00	1.36	C	10581	11405	10902
60	36	132	2.38	1.58	D	12554	13527	12916
60	42	66	1.39	1.10	A	4477	5092	4816
60	42	66	1.67	1.28	B	5321	5991	5676

On all sizes s = 8 inches.

# ENGINEERING INSTITUTE OF CANADA STANDARD SPECIAL CASTINGS FOR WATER

## Standard Reducers and Increasers, Type No. 2



Short Increaser, 48 to 30 x 66 inches v

Table No. 17—Continued

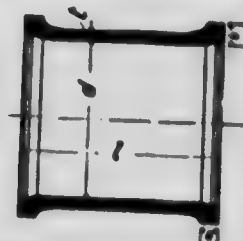
Nominal Diam. Inches		v	Thickness, Inches		Class	Weights, Pounds		
e	f		t1	t2		Spigot Ends	Large End Bell	Small End Bell
60	42	66	2.00	1.54	C	6440	7264	6855
60	42	66	2.38	1.78	D	7619	8593	8089
60	42	132	1.39	1.10	A	8072	8687	8411
60	42	132	1.67	1.28	B	9595	10265	9950
60	42	132	2.00	1.54	C	11614	12439	12030
60	42	132	2.38	1.78	D	13743	14716	14213
60	48	66	1.39	1.20	A	4957	5572	5363
60	48	66	1.67	1.42	B	5832	6502	6287
60	48	66	2.00	1.71	C	7006	7830	7555
60	48	66	2.38	1.96	D	8285	9259	8910
60	48	132	1.39	1.26	A	8938	9552	9344
60	48	132	1.67	1.42	B	10517	11187	10872
60	48	132	2.00	1.71	C	12634	13458	13183
60	48	132	2.38	1.96	D	14943	15917	15568
60	54	66	1.39	1.35	A	5404	6019	5910
60	54	66	1.67	1.55	B	6348	7018	6861
60	54	66	2.00	1.90	C	7750	8574	8444
60	54	66	2.38	2.23	D	9178	10152	9992
60	54	132	1.39	1.35	A	9745	10360	10251
60	54	132	1.67	1.55	B	11462	12132	12075
60	54	132	2.00	1.90	C	13979	14803	14673
60	54	132	2.38	2.23	D	16557	17530	17371

On all sizes s = 8 inches.

# ENGINEERING INSTITUTE OF CANADA STANDARD SPECIAL CASTINGS FOR WATER

## Standard Sleeves

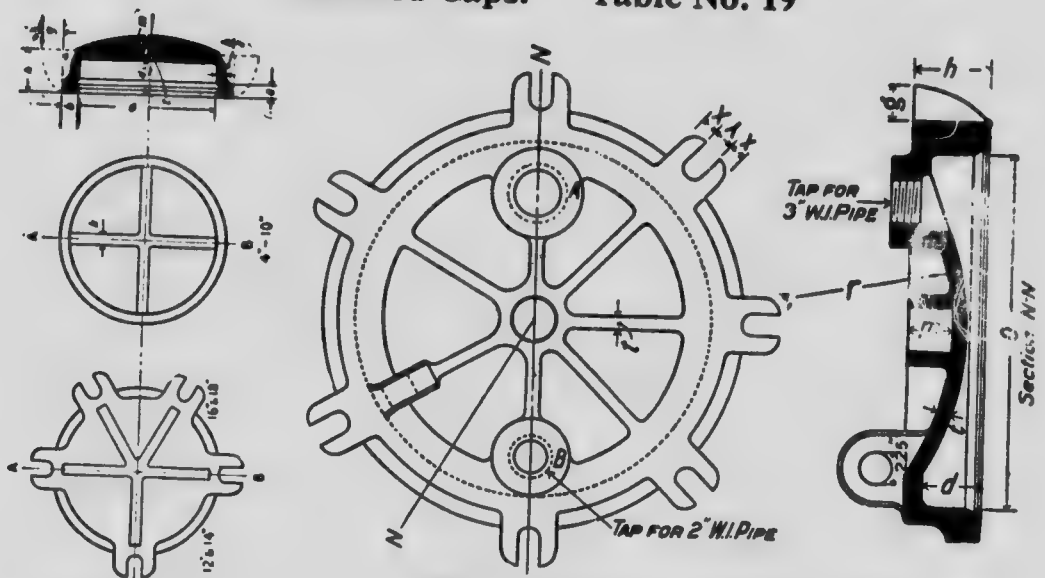
Table No. 18



For dimensions a and b  
see Table No. 1

Nom'l Diam. Inches	Class	D	L	T	Approx. Weight Pounds	Nom'l Diam. Inches	Class	D	L	T	Approx. Weight Pounds
4	D	5.80	10	.65	47	36	B	39.40	15	1.40	943
4	D	5.80	15	.65	61	36	C	39.80	15	1.60	1077
6	D	7.90	10	.70	68	36	D	40.20	15	1.80	1217
6	D	7.90	15	.70	87	36	A	39.60	24	1.25	1202
8	D	10.10	12	.75	104	36	B	39.40	24	1.40	1362
8	D	10.10	15	.75	119	36	C	39.80	24	1.60	1563
10	D	12.20	12	.80	123	36	D	40.20	24	1.80	1772
10	D	12.20	18	.80	176	42	A	45.30	15	1.40	1697
12	D	14.30	14	.85	174	42	B	45.60	15	1.50	1184
12	D	14.30	18	.85	223	42	C	46.20	15	1.75	1381
14	B	16.20	15	.85	220	42	D	46.70	15	1.95	1561
14	B	16.20	18	.85	249	42	A	45.30	24	1.40	1577
14	D	16.50	15	.90	240	42	B	45.60	24	1.50	1702
14	D	16.50	18	.90	280	42	C	46.20	24	1.75	1997
16	B	18.50	15	.90	274	42	D	46.70	24	1.95	2262
16	B	18.50	24	.90	391	48	A	51.60	15	1.50	1337
16	D	18.90	15	1.00	305	48	B	51.90	15	1.65	1481
16	D	18.90	24	1.00	443	48	C	52.50	15	1.95	1752
18	B	20.60	15	.95	321	48	D	53.10	15	2.20	1986
18	B	20.60	24	.95	462	48	A	51.60	24	1.50	1922
18	D	21.00	15	1.05	360	48	B	51.90	24	1.65	2129
18	D	21.00	24	1.05	518	48	C	52.50	24	1.95	2532
20	B	22.70	15	1.00	374	48	D	53.10	24	2.20	2879
20	B	22.70	24	1.00	532	54	A	57.70	15	1.60	1612
20	D	23.10	15	1.15	440	54	B	58.20	15	1.80	1835
20	D	23.10	24	1.15	625	54	C	58.90	15	2.15	2156
24	B	26.90	15	1.05	477	54	D	59.50	15	2.45	2450
24	B	26.90	24	1.05	680	54	A	57.70	24	1.60	2316
24	D	27.40	15	1.25	583	54	B	58.20	24	1.80	2634
24	D	27.40	24	1.25	821	54	C	58.90	24	2.15	3126
30	A	32.80	15	1.15	648	54	D	59.50	24	2.45	3571
30	B	33.10	15	1.15	652	60	A	63.90	15	1.70	1906
30	C	33.50	15	1.32	760	60	B	64.50	15	1.90	2127
30	D	33.80	15	1.50	876	60	C	65.30	15	2.25	2491
30	A	32.80	24	1.15	943	60	D	65.90	15	2.60	2895
30	B	33.10		1.15	949	60	A	63.90	24	1.70	2731
30	C	33.50	24	1.32	1088	60	B	64.50	24	1.90	3058
30	D	33.80	24	1.50	1262	60	C	65.30	24	2.25	3601
36	A	39.00	15	1.25	833	60	D	65.90	24	2.60	4231

**ENGINEERING INSTITUTE OF CANADA  
STANDARD SPECIAL CASTINGS FOR WATER  
Standard Caps. Table No. 19**



Bosses A and B cast on only when so ordered

Nominal Diam. Inches	Class	d	e	l	t	m	k	r	Approx. Weight Pounds
4	D	4.00	6.70	....	.60	....	....	....	26
6	D	4.00	7.80	....	.65	....	....	....	40
8	D	4.00	10.00	....	.75	....	....	....	59
10	D	4.00	12.10	....	.75	....	....	....	81
12	B	4.00	14.20	....	.75	1.50	.75	16.20	104
14	B	4.00	16.10	....	.90	1.75	.75	18.70	140
16	B	4.00	18.45	....	.90	1.90	.75	22.40	149
16	B	4.00	18.40	....	.90	1.90	.75	22.40	183
18	B	4.00	20.50	....	1.00	2.00	.75	27.00	198
18	B	4.00	20.92	....	1.00	2.00	.75	27.00	226
20	B	4.00	22.60	....	1.00	2.00	1.00	32.90	242
20	B	4.00	23.06	....	1.00	3.00	1.00	18.20	276
24	B	4.00	26.80	2.50	1.05	3.50	1.00	23.50	308
24	B	4.00	27.32	2.50	1.05	3.50	1.00	23.50	392
30	A	4.50	32.74	2.62	1.15	3.50	1.15	34.80	442
30	A	4.50	33.00	2.62	1.15	3.50	1.15	34.80	589
30	B	4.50	33.40	2.62	1.15	3.50	1.15	34.80	596
30	C	4.50	33.74	2.62	1.15	3.50	1.15	34.80	647
36	A	4.50	38.96	3.12	1.25	4.00	1.25	44.00	704
36	A	4.50	39.30	3.12	1.30	3.95	1.25	44.00	849
36	B	4.50	39.70	3.12	1.35	3.90	1.25	44.00	918
42	A	5.00	40.16	3.12	1.40	3.85	1.25	44.00	998
42	A	5.00	45.20	3.37	1.40	4.00	1.40	63.50	1084
42	A	5.00	45.50	3.37	1.50	3.90	1.40	63.50	1300
42	B	5.00	46.10	3.37	1.60	3.80	1.40	63.50	1398
42	C	5.00	46.58	3.37	1.70	3.70	1.40	63.50	1539
48	A	5.00	51.50	3.62	1.70	4.00	1.50	76.50	1679
48	A	5.00	51.80	3.62	1.90	3.80	1.50	76.50	1772
48	B	5.00	52.40	3.62	2.00	3.70	1.50	76.50	1943
48	C	5.00	52.98	3.62	2.10	3.60	1.50	76.50	2144
54	A	5.50	57.66	3.87	1.90	4.50	1.50	82.00	2341
54	A	5.50	58.10	3.87	2.00	4.40	1.50	82.00	2329
54	B	5.50	58.80	3.87	2.10	4.30	1.50	82.00	2519
54	C	5.50	59.40	3.87	2.20	4.20	1.50	82.00	2770
60	A	5.50	63.80	4.12	2.00	4.50	1.50	99.00	3009
60	A	5.50	64.40	4.12	2.10	4.40	1.50	99.00	2868
60	B	5.50	65.20	4.12	2.20	4.30	1.50	99.00	3082
60	C	5.50	65.82	4.12	2.30	4.20	1.50	99.00	3388
									3557

## Section: N-N

**Standard Plugs**

24 to 60 inches  
 Bosses a and b cast on only when so ordered

4 to 20 inches

Section A-A

TAP FOR 3" W.P. PIPE

TAP FOR 2" W.P. PIPE

Dimensions: a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z

**Bosses a and b cast on only when so ordered**

35

# STANDARD SPECIAL CASTINGS FOR WATER

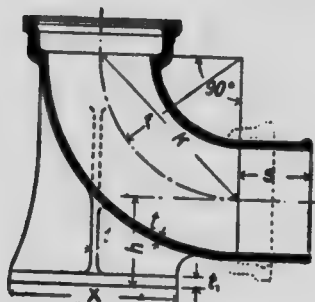


Table No. 21— $\frac{1}{4}$  Curves with Bases

Nominal Diameter Inches	Class	t	r	k	s	h	Approx. Weight Pounds
4	D	.52	16	22.60	8	5.50	141
6	D	.55	16	22.60	8	6.50	214
8	D	.60	16	22.60	10	7.50	309
10	D	.68	16	22.60	12	9.00	436
12	D	.75	16	22.60	12	10.00	579
14	B	.66	18	25.50	12	12.00	717
14	D	.82	18	25.50	12	12.00	815
16	B	.70	24	34.00	12	13.00	1053
16	D	.89	24	34.00	12	13.00	1209
18	B	.75	24	34.00	12	14.00	1264
18	D	.96	24	34.00	12	14.00	1442
20	B	.80	24	34.00	12	15.00	1619
20	D	1.03	24	34.00	12	15.00	1849
24	B	.89	30	42.40	12	17.50	2379
24	D	1.16	30	42.40	12	17.50	2745
30	A	.88	36	50.90	12	21.00	3718
30	B	1.03	36	50.90	12	21.00	3986
30	C	1.20	36	50.90	12	21.00	4358
30	D	1.37	36	50.90	12	21.00	4740
36	A	.99	48	67.90	12	24.50	6002
36	B	1.15	48	67.90	12	24.50	6538
36	C	1.36	48	67.90	12	24.50	7158
36	D	1.58	48	67.90	12	24.50	7858

## LEAD IN BELL AND SPIGOT PIPE JOINTS

Nominal Diameter Inches	Approx. Pounds Lead in Pipe Joint 2 inches Deep	Approx. Pounds Lead in Pipe Joint 2½ inches Deep	Approx. Pounds Lead in Pipe Joint 2¾ inches Deep	Approx. Pounds Lead in Pipe Joint Solid
3	6.00	6.50	7.00	10.25
4	7.50	8.00	8.75	13.00
6	10.25	11.25	12.25	18.00
8	13.25	14.50	15.75	23.00
10	16.00	17.50	19.00	31.00
12	19.00	20.50	22.50	36.50
14	22.00	24.00	26.00	38.50
16	30.00	33.00	35.75	64.75
18	33.80	36.90	40.00	72.00
20	37.00	40.50	44.00	80.00
24	44.00	48.00	52.50	95.00
30	54.25	59.50	64.75	117.50
36	64.75	71.00	77.25	140.25
42	75.25	78.75	85.50	155.25
48	85.50	94.00	102.25	202.25
54	97.60	107.10	116.60	238.60
60	108.30	118.80	129.50	255.50
72	128.00	140.50	153.00	302.50
84	147.00	161.50	175.60	348.00

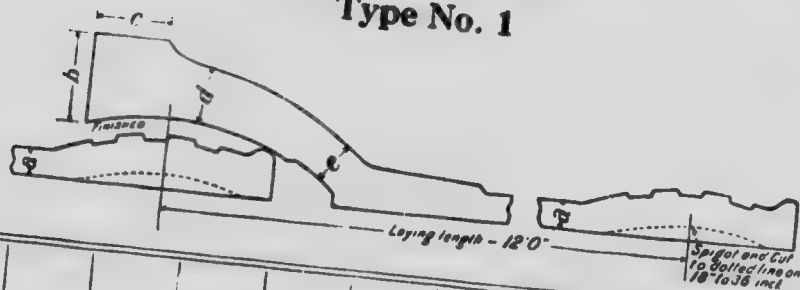
The above table gives the calculated weight of lead required for pipe joints, both with and without gasket. The weight of a cubic inch of lead is taken as 0.41 pound. An allowance has been made for lead to project beyond face of the bell for calking.

The specifications for pipes allow the lead space to vary from those given in tables, hence the weight of lead required for the joint may vary approximately 11 to 16 per cent. from weights given above.



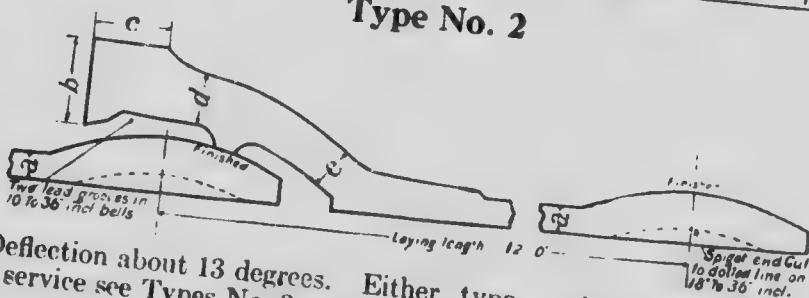
**STANDARD CAST IRON PIPE**  
**Table No. 22—Flexible Joint Pipe. Standard Dimension**  
**Thicknesses and Weights**

**Type No. 1**



Size Inches	Class	a	b	c	d	e	Weight per Length Pounds	Lead per Solid Joint Pounds	
								Type 1	Type 2
6	B	.48	1.56	1.37	1.00	.87			
6	D	.55	1.56	1.37	1.00	.87			
8	B	.51	1.81	1.56	1.12	.94	503	11.9	9
8	D						555	11.9	9
10	B	.60	1.81	1.56	1.12	.94	673	19	14
10	D	.57	2.06	1.75	1.18	1.00	780		
12	B	.68	2.06	1.75	1.18	1.00	947	19	14
12	D	.62	2.25	1.87	1.25	1.06	1080	28	22
		.75	2.25	1.87	1.25	1.06	1210	28	22
14	B	.66	2.50	2.00	1.31	1.12	1400	49	39
14	D	.82	2.50	2.00	1.31	1.12		49	39
16	B	.70	2.75	2.12	1.43	1.25	1450	64	51
16	D	.89	2.75	2.12	1.43	1.25	1750	64	51
18	B	.75	2.87	2.25	1.56	1.31	1862	76	60
18	D						2250	76	60
20	B	.96	2.87	2.25	1.56	1.31	2300	91	73
20	D	.80	3.12	2.37	1.62	1.37			
24	B	1.03	3.12	2.37	1.62	1.37	2760	91	73
24	D	.89	3.37	2.68	1.75	1.50	2625	112	92
		1.16	3.37	2.68	1.75	1.50	3200	112	92
30	B	1.03	3.87	3.18	2.12	1.72	3534	136	112
30	D	1.37	3.87	3.18	2.12	1.72	4290	136	112
36	B	1.15	4.12	3.50	2.50	1.94	5067	181	146
36	D	1.58	4.12	3.50	2.50	1.94	6360	181	146
							6063	225	177
							7900	225	177

**Type No. 2**



Deflection about 13 degrees. Either type made to order only. For heavy service see Types No. 3 and No. 4.



# STANDARD FLANGED SPECIAL CASTINGS FOR WATER

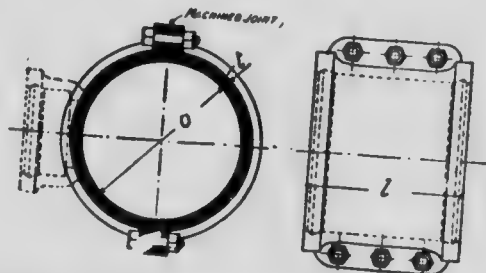
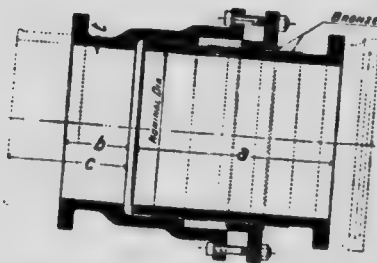


**Table No. 24 Standard Manifolds**

Nom'l Diam. Inches		t	n	r	s	p	l	No. of Out-lets	Approx. Weight Pounds
m	o								
6	4	.55	.52	7.50	11.00	7	26.00	2	135
8	4	.60	.52	7.50	11.00	8	48.00	4	304
8	6	.60	.55	9.50	13.00	8	32.00	2	215
10	4	.68	.52	7.50	11.00	9	70.00	6	560
10	6	.68	.55	9.50	13.00	9	45.00	3	381
12	8	.68	.60	11.50	15.50	9	38.50	2	337
12	6	.75	.55	9.50	13.00	10	58.00	4	617
12	8	.75	.60	11.50	15.50	10	38.50	2	441

**Table No. 25 Standard Return Bends**

Nom'l Diam. Inches	Class	t	l	l2	Approx. Weight Pounds
4	D	.52	5.50	11.00	65
6	D	.55	6.50	13.00	104
8	D	.60	7.75	15.50	167
10	D	.68	9.00	18.00	260
12	D	.75	10.50	21.00	394



**Table No. 26 Standard Expansion Joint**

Nominal Diam. Inches	Class	a	b	c	t	Weight Pounds	
						Bell and Spigot	Flange Ends
4	D	16	5.00	10	.52	129	111
6	D	16	5.00	10	.55	190	160
8	D	18	5.00	10	.60	295	250
10	D	18	5.00	10	.68	422	357
12	D	18	6.00	12	.75	591	497
14	D	20	6.00	12	.82	777	658
16	D	20	6.00	12	.89	990	851
18	D	22	7.50	12	.96	1180	1010
20	D	22	7.50	12	1.03	1430	1231
24	D	22	7.50	12	1.16	1903	1654

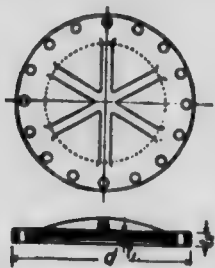
**Table No. 27 Standard Split Sleeves with and without Branch Outlet**

Nominal Diam. Inches	Class	t	l	o	Diam. Branch Inches	Bolts		Weight Pounds	
						Size	No.	With-out Branch	With Branch
4	D	.65	10	5.70		.75	6	72	
6	D	.70	10	7.80	4	.88	6	86	109
8	D	.75	12	10.00	4	1.00	6	133	156
10	D	.80	12	12.10	4	1.13	6	158	181
12	D	.85	14	14.20	6	1.13	8	222	255
14	B	.85	15	16.10	6	1.00	8	264	297
16	D	.90	15	16.45	6	1.13	8	323	319
18	B	.90	15	18.40	6	1.13	8	386	356
20	D	1.00	15	18.80	6	1.13	8	359	392
22	B	.95	15	20.50	6	1.13	8	373	406
24	D	1.05	15	20.92	6	1.13	8	460	502
26	B	1.00	15	22.60	6	1.13	8	428	461
28	D	1.15	15	23.08	6	1.13	8	502	535
30	B	1.05	15	26.80	6	1.13	8	535	568
32	D	1.25	15	27.32	6	1.25	8	652	685

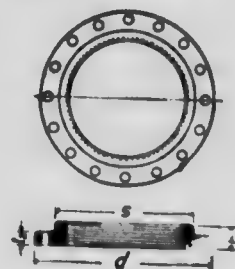
See Table No. 34 for flange diameters, bolt circles, etc.

WATER

# STANDARD FLANGED SPECIAL CASTINGS FOR WATER



Blank Flanges



Screw Flanges

For use with Standard Water Pipe  
Classes A, B, C, D

Blank Flanges 3-14 inches, no Ribs; 16-30 inches, 3 Ribs; 36-48 inches, 4 Ribs

Table No. 28—Blank Flanges

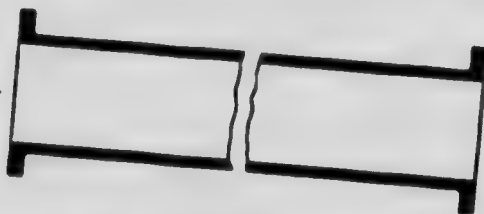
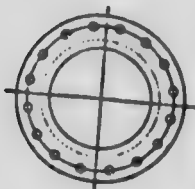
Nom'l Diam. In.	Class	d	t1	t2	Approx. Weight Pounds
3	D	7.50	.65	.85	9
4	D	9.00	.65	.91	14
6	D	11.00	.70	.96	23
8	D	13.50	.75	1.03	36
10	D	16.00	.80	1.15	55
12	D	19.00	.85	1.26	84
14	B	21.00	.85	1.12	94
14	D	21.00	.90	1.36	108
16	B	23.50	.90	1.18	127
16	D	23.50	1.00	1.47	151
18	B	25.00	.95	1.26	150
18	D	25.00	1.05	1.57	177
20	B	27.50	1.00	1.33	194
20	D	27.50	1.15	1.68	234
24	B	32.00	1.05	1.47	278
24	D	32.00	1.25	1.87	341
30	A	38.75	1.15	1.45	423
30	B	38.75	1.15	1.68	452
30	C	38.75	1.32	1.93	518
30	D	38.75	1.50	2.19	589
36	A	46.00	1.25	1.62	647
36	B	46.00	1.40	1.86	732
36	C	46.00	1.60	2.17	844
36	D	46.00	1.80	2.50	959
42	A	52.75	1.40	1.78	955
42	B	52.75	1.50	2.05	1053
42	C	52.75	1.75	2.44	1238
42	D	52.75	1.95	2.80	1397
48	A	59.50	1.50	2.02	1328
48	B	59.50	1.65	2.26	1469
48	C	59.50	1.95	2.70	1745
48	D	59.50	2.20	3.07	1975

Table No. 29—Screw Flanges

Nom'l Diam. In.	Class	d	s	p	t2	Approx. Weight Pounds
3	D	7.50	4.38	1.50	.85	9
4	D	9.00	5.50	1.63	.91	12
6	D	11.00	7.63	1.75	.96	18
8	D	13.50	9.75	2.00	1.03	27
10	D	16.00	12.00	2.25	1.15	40
12	D	19.00	14.13	2.38	1.26	60
14	B	21.00	16.50	2.50	1.12	76
14	D	21.00	16.50	2.50	1.36	84
16	B	23.50	18.50	2.63	1.18	90
16	D	23.50	18.50	2.63	1.47	103
18	B	25.00	20.50	2.75	1.26	107
18	D	25.00	20.50	2.75	1.57	120
20	B	27.50	22.50	2.75	1.33	128
20	D	27.50	22.50	2.75	1.68	145
24	B	32.00	26.50	3.00	1.47	174
24	D	32.00	26.50	3.00	1.87	189

For drilling, etc., of blank flanges and screw flanges, see Table No. 34.

# STANDARD FLANGED PIPE FOR WATER



**Table No. 30—Standard Thicknesses and Weights**

Standard Thicknesses and Weights									
Nominal Diameter, inches	Diameter of Flange, inches	Class A 100 Foot Head, 43 Pounds Pressure				Class B 200 Foot Head, 86 Pounds Pressure			
		Thickness, inches	Weight, Pounds per			Thickness, inches	Weight, Pounds per		
			Foot	Length	Single Flange		Foot	Length	Single Flange
3	7.50	.39	13.0	168.0		.42	14.6	188.0	6.3
4	9.00	.42	18.0	234.0	5.8	.45	20.1	259.0	9.1
6	11.00	.44	27.9	358.0	9.0	.48	31.1	398.0	12.3
8	13.50	.46	38.7	498.0	11.8	.51	42.7	549.0	18.2
10	16.00	.50	51.9	671.0	23.9	.57	58.8	759.0	26.6
12	19.00	.54	67.0	876.0	35.8	.62	76.4	998.0	40.4
14	21.00	.57	82.3	1070.0	41.4	.66	94.7	1231.0	47.3
16	23.50	.60	98.8	1290.0	52.5	.70	114.6	1495.0	60.1
18	25.00	.64	118.3	1528.0	54.5	.75	137.8	1779.0	62.5
20	27.50	.67	137.4	1783.0	66.8	.80	163.1	2114.0	78.7
24	32.00	.76	186.5	2424.0	92.9	.89	217.3	2821.0	106.8
30	38.75	.88	266.1	3486.0	146.1	1.03	312.6	4077.0	162.9
36	46.00	.99	358.7	4733.0	214.6	1.15	418.7	5497.0	236.6
40	50.75	1.06	427.2	5684.0	279.1	1.23	497.0	6586.0	311.2
42	52.75	1.10	464.6	6178.0	301.3	1.28	542.2	7178.0	335.9
48	59.50	1.26	608.0	8112.0	408.1	1.42	687.2	9132.0	442.9
		Class C 300 Foot Head, 130 Pounds Pressure				Class D 400 Foot Head, 173 Pounds Pressure			
		Thickness, inches	Foot	Length	Single Flange	Thickness, inches	Foot	Length	Single Flange
3	7.50	.45	15.5	199.0	6.6	.48	16.4	211.0	7.1
4	9.00	.48	21.3	275.0	9.7	.52	22.8	295.0	10.4
6	11.00	.51	32.9	421.0	12.8	.55	35.3	451.0	13.7
8	13.50	.56	48.0	614.0	19.0	.60	51.2	654.0	20.1
10	16.00	.62	65.5	840.0	27.3	.68	71.4	916.0	29.6
12	19.00	.68	85.4	1109.0	42.0	.75	93.7	1216.0	45.6
14	21.00	.74	108.1	1397.0	49.6	.82	119.2	1539.0	54.5
16	23.50	.80	133.3	1727.0	63.9	.89	147.5	1910.0	70.2
18	25.00	.87	162.4	2083.0	66.9	.96	178.4	2287.0	73.4
20	27.50	.92	190.6	2454.0	83.3	1.03	212.3	2731.0	92.1
24	32.00	1.04	257.6	3321.0	114.7	1.16	286.0	3686.0	126.9
30	38.75	1.20	366.9	4759.0	178.1	1.37	421.2	5436.0	191.0
36	46.00	1.36	497.7	6500.0	263.8	1.58	581.9	7555.0	286.0
40	50.75	1.48	601.6	7921.0	350.7	1.72	703.4	9203.0	389.0
42	52.75	1.54	657.4	8635.0	373.0	1.78	764.1	9973.0	402.0
48	59.50	1.71	832.7	10979.0	493.4	1.96	960.8	12578.0	524.3

Note.—Pipes made in 12 foot lengths.

Note.—Pipes made in 12 foot lengths and faced  $\frac{1}{8}$  inch short for gaskets. All dimensions in inches. Above are neat finished weights. Allowance must be made for variation and finish. Flange and Spigot or Flange and Bell Pipes made to order. For drilling dimensions, etc., see Table No. 34.

# FLANGES AND FLANGE FITTINGS

## CANADIAN AND AMERICAN STANDARD

The use of flanges and flange fittings has been increasing quite rapidly of late years, in fact, a flange joint is the standard form of connection in many classes of piping. For most purposes the ordinary screw connection should not be used above 6" pipe size on account of the difficulty of making and breaking joints.

As the flange fitting business grew, each manufacturer made up patterns for whatever sizes were called for, to his own personal ideas or knowledge at that time.

These dimensions were later published in catalogues and a wide variation in dimensions was found.

The variation in the diameter and thickness of flanges as well as the bolt circle, size and number of bolts on standard weight material caused the users and manufacturers considerable confusion and expense.

This brought about the movement by the American Society of Mechanical Engineers and the Master Steam & Hot Water Fitters Association, assisted by the manufacturers of these lines, the result of which was the adoption of what is known as the A. S. M. E. Standard of 1894. This covered flange dimensions and bolting only.

A few years later the manufacturers began to realize that the extra heavy 250\* flanges and bolting were in the same state of confusion. This resulted in the adoption of what has been known as the Manufacturers' Standard of 1901.

It became evident in the past few years that the centre to face and face to face dimensions of all flange fittings, including low pressure, standard pressure and extra heavy pressure, should be established. After considerable work on the part of the M. S. & H. W. F. A. and the A. S. M. E. a standard known as the 1912 U.S. Standard was adopted.

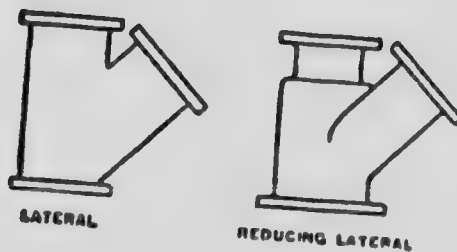
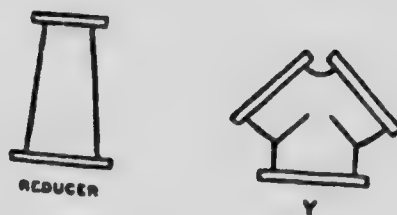
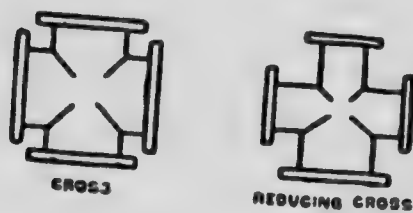
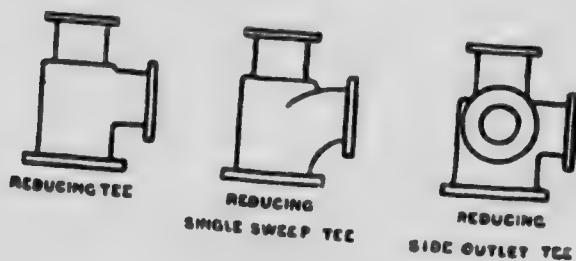
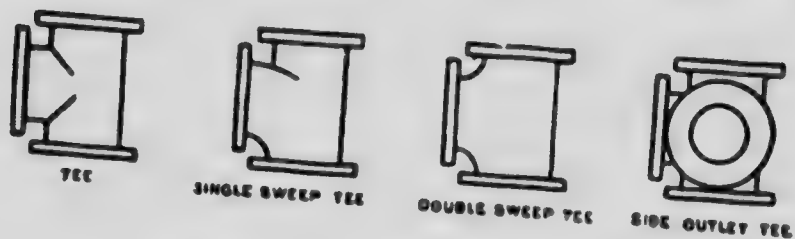
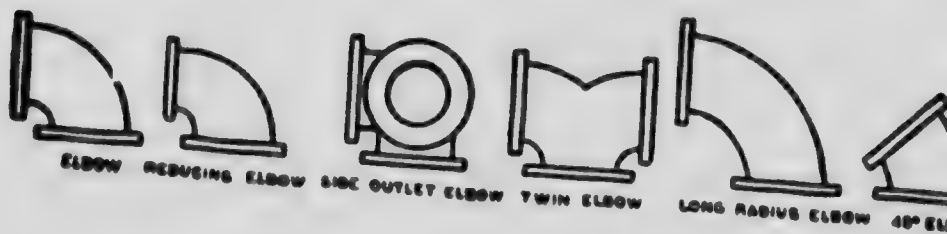
The adoption of this standard opened a discussion among those interested in the subject. It was found that the dimensions presented in the 1912 U.S. Standard differed from the dimensions which had been quite universally used by manufacturers and which covered a large majority of the fittings made.

At a meeting of manufacturers held in New York City, July, 1912, a standard known as the Manufacturers' Standard was adopted by them.

This left the Flange Fitting subject in the unfortunate position of there being two standards. When this condition came before the Committee of the A. S. M. E. an effort was made by this Committee with that of the Manufacturers' Committee to harmonize, if possible, the differences then existing between these two Standards.

After considering the various phases of the subject covering uniformity of design, strength of fitting, strength of bolting as well as the commercial features, a compromise was made.

In this compromise the bolting was increased where it was thought necessary. Additional size flanges were added and the centre to face and face to face dimensions were altered to conform to these requirements.



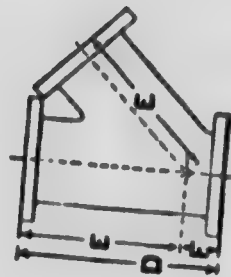
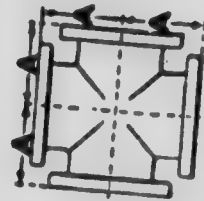
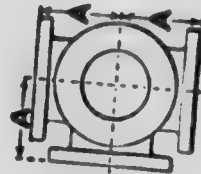
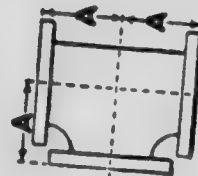
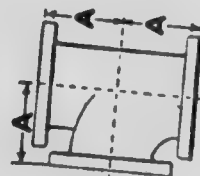
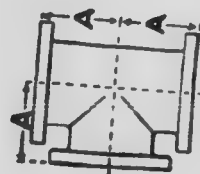
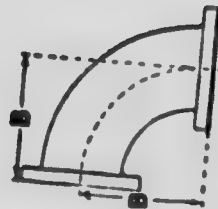
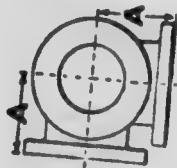
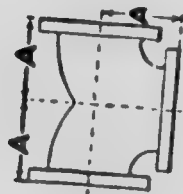


## EXPLANATORY NOTES



- (1)—Standard and Extra Heavy Reducing Elbows carry same dimensions centre to face as regular Elbows of largest straight size.
- (2)—Standard and Extra Heavy Tees, Crosses and Laterals, reducing on run only, carry same dimensions face to face as largest straight size.
- (3)—If Flanged Fittings for lower working pressure than 125 pounds are made, they shall conform in all dimensions except thickness of shell to this standard and shall have the guaranteed working pressure cast on each fitting.  
Flanges for these fittings must be standard dimensions.
- (4)—Where long radius fittings are specified, it has reference only to Elbows which are made in two centre to face dimensions and to be known as Elbows and Long Radius Elbows, the latter being used only when so specified.
- (5)—All standard weight fittings must be guaranteed for 125 pounds working pressure, and extra heavy fittings for 250 pounds working pressure, and each fitting must have some mark cast on it indicating the maker and guaranteed working steam pressure.
- (6)—All extra heavy fittings and flanges to have a raised surface of 1-16" high inside of bolt holes for gaskets.  
Standard weight fittings and flanges to be plain faced.  
Bolt holes to be  $\frac{1}{8}$ " larger in diameter than bolts.  
Bolt holes to straddle centre line.
- (7)—Size of all fittings scheduled indicates inside diameter of ports, except for extra heavy fittings 14" and larger when the port diameter is  $\frac{3}{4}$ " smaller than nominal size.
- (8)—The face to face dimensions of Reducers, either straight or eccentric, for all pressures, shall be the same face to face as given in table of dimensions.
- (9)—Square head bolts with hexagonal nuts are recommended.  
For bolts,  $1\frac{1}{8}$ " diameter and larger, studs with a nut on each end are satisfactory.  
Hexagonal nuts for pipe sizes 1" to 46" on 125 pounds standard, and 1" to 16" on 250 pounds standard can be conveniently pulled up with open wrenches of minimum design of heads. Hexagonal nuts for pipe sizes 48" to 100" on 125 pounds, and 18" to 48" on 250 pounds standards can be conveniently pulled up with box wrenches.
- (10)—Twin Elbows, whether straight or reducing, carry same dimensions centre to face and face to face as regular straight size ells and tees.  
Side Outlet Elbows and Side Outlet Tees, whether straight or reducing sizes, carry same dimensions centre to face and face to face as regular tees having same reductions.
- (11)—Bull Head Tees or Tees increasing on outlet will have same centre to face and face to face dimensions as a straight fitting of the size of the outlet.
- (12)—Tees and Crosses 16" and down, reducing on the outlet, use the same dimensions as straight sizes of the larger port.  
Sizes 18" and up, reducing on the outlet, are made in two lengths depending on the size of the outlet as given in the table of dimensions.  
Laterals 16" and down, reducing on the branch, use the same dimensions as straight sizes of the larger port.  
Sizes 18" and up, reducing on the branch, are made in two lengths depending on the size of the branch as given in the table of dimensions.
- (13)—The dimensions of reducing flanged fittings are always regulated by the reductions of the outlet or branch. Fittings reducing on the run only, the Y's and body pattern will always be used.  
Y's are special and are made to suit conditions.  
Double sweep tees are not made reducing on the run.
- (14)—STEEL FLANGES, FITTINGS AND VALVES ARE RECOMMENDED FOR SUPERHEATED STEAM.

# STANDARD FLANGED FITTINGS STRAIGHT SIZES



# GENERAL DIMENSIONS

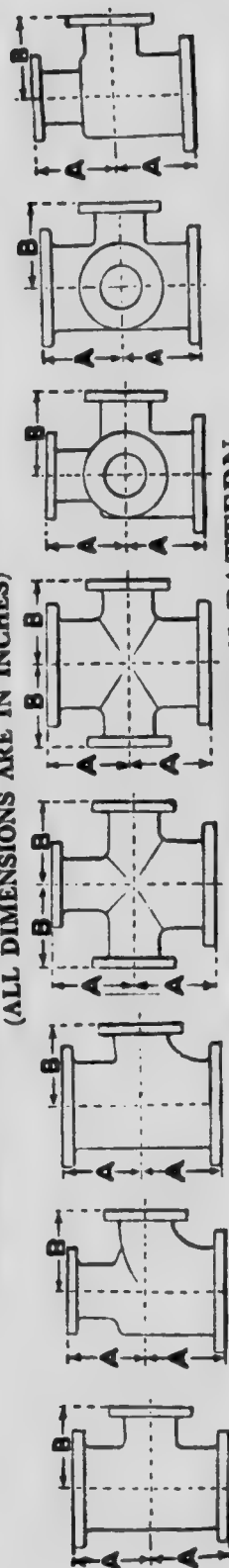
## STANDARD FLANGED FITTINGS (ALL DIMENSIONS ARE IN INCHES)

## STRAIGHT SIZES

Table No. 31

Size.....	1	1½	2	2½	3	3½	4	4½	5	6	7	8	9	10	12	14	15	16	18	20	22	24	26	28	30	32	34	36	40	
AA-Face to Face, Tee and Crosses.....	7	7½	8	9	10	11	12	13	14	15	16	17	18	20	22	24	26	28	30	32	36	40	44	46	48	50	52	54	56	60
A-Centre to Face, Ells, Tees and Crosses.....	3½	3¾	4	4½	5	5½	6	6½	7	7½	8	8½	9	10	11	12	14	14½	15	16½	18	20	22	23	24	25	26	27	28	30
B-Centre to Face, Long Radius Ells.....	5	5½	6	6½	7	7½	8	8½	9	10	10½	11	11½	12	13	14	15	16	17	18	20	22	23	24	25	26	27	28	30	30
C-Centre to Face 45° Ells.....	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	10	11	12	13	14	15	16	17	18	19	20	21	22	24
D-Face to Face Laterals.....	7½	8	9	10½	12	13	14½	15	16½	17	18	19½	21	23	25	27	29	31	33	35	37½	40½	44	46½	48	50½	52½	54	56	60
E-Centre to Face Laterals.....	5½	6½	7	8	9½	10	11½	12	13½	14½	16	17½	19	21	23	25	27	29	31	33	35	37½	40½	44	46½	48	50½	52½	54	56
F-Centre to Face Laterals.....	1½	1¾	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	10	11	12	13	14	15	16	17	18	19	20	21	22
G-Face to Face Reducers.....																														
Diameter of Flanges.....	4	4½	5	6	7	7½	8	9	10	11	12	13	14	15	16	17	18	19	20	22	24	26	28	30	32	34	36	38	40	40
Thickness of Flanges.....	1½	1¾	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Minimum Metal Thickness of Body.....	¾	7⁄8	1	1½	1¾	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	10	11	12	13	14	15	16	17	18	19
Size.....	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100
AA-Face to Face, Tee and Crosses.....	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	120
A-Centre to Face, Ells, Tees and Crosses.....	31	32	33	34	35	37	39	41	42	44	45	47	48	50	51	53	54	56	58	60	62	63	65	67	68	69	71	72	74	74
B-Centre to Face, Long Radius Ells.....	50½	51½	52½	54	55½	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	103
C-Centre to Face 45° Ells.....	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
G-Face to Face Reducers.....	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100
Diameter of Flanges.....	53	55½	57½	59½	61½	64	66½	69½	71½	73	75½	78	80½	83½	86½	89½	92½	95½	98½	101½	104	107	110	113	116	119	121½	124	127	127
Thickness of Flanges.....	2½	2¾	3	3½	3¾	4	4½	4¾	5	5½	5¾	6	6½	6¾	7	7½	7¾	8	8½	8¾	9	9½	9¾	10	10½	10¾	11	11½	11¾	11¾
Minimum Metal Thickness of Body.....	1½	1¾	2	2½	2¾	3	3½	3¾	4	4½	4¾	5	5½	5¾	6	6½	6¾	7	7½	7¾	8	8½	8¾	9	9½	9¾	10	10½	10¾	10¾

# **STANDARD FLANGED FITTINGS** **GENERAL DIMENSIONS REDUCING TEES AND CROSSES** (ALL DIMENSIONS ARE IN INCHES)



**Table No. 32—SHORT BODY PATTERN**

Size	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8	9	10	12	14	15	16	18	20	22	24	26	28	30	32	34	36	38	40
*Size of Outlet and Smaller	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	
AA-Face to Face, Run	28	28	30	32	32	34	36	36	38	40	40	42	44	44	46	48	48	50	52	52	54	56	56	58	60	60	62	64	64	66	
A-Centre to Face, Run	46	46	48	52	52	54	58	58	62	66	66	68	70	70	74	80	80	84	86	86	88	94	94	96	100	100	104	106	106	110	
AA-Face to Face, Run	23	23	24	26	26	27	29	29	31	33	33	34	35	35	37	40	40	42	43	43	44	47	47	48	50	50	52	53	53	55	
A-Centre to Face, Run	30	31	33	34	35	36	37	39	40	41	42	44	45	46	47	48	49	50	52	53	54	56	57	58	61	62	63	64	65	67	
B-Centre to Face, Outlet																															

All reducing fittings 1' to 16" inclusive have the same centre to face dimensions as straight size fittings

**\*LONG BODY PATTERNS** { Are used when outlets are larger than given in the above table, therefore have same dimensions as straight size fittings.

The dimensions of "Reducing Flanged Fittings" are always regulated by the reduction of the outlet.

**FITTING REDUCING ON THE RUN ONLY**, the long body pattern will always be used except Double Tees, on which the reduced end is always longer than the regular fitting. Dimensions on request.

**BULL HEADS OR TEES** having outlets larger than the run, will be the same length centre to face of all openings as a tee with all openings of the size of the outlet, for example: a 12 x 12 x 18 inch tee will be governed by the dimensions of the 18 inch long body tee—namely, 16 1/2 inches centre to face of all openings and 33 inches face to face.

**REDUCING ELBOWS** carry same centre to face dimensions as regular elbows of largest straight size.

governed by the dimensions of the 18 inch long body tee—namely, 18 1/2 inches from the  
 33 inches face to face.  
**REDUCING ELBOWS** carry same centre to face dimensions as regular elbows of largest straight size.

# STANDARD FLANGED FITTINGS GENERAL DIMENSION-REDUCING LATERALS (ALL DIMENSIONS ARE IN INCHES)

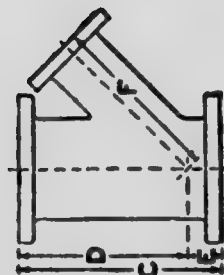
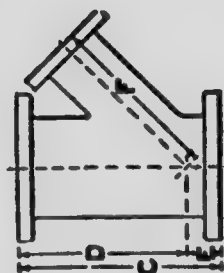


Table No. 33

## SHORT BODY PATTERN

Size.....	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8	9	10	12	14	15	16	18	20	22	24	26	28	30
*Size of Branch and Smaller.....	All reducing fittings 1" to 16" inclusive have same centre to face dimensions as straight size fittings.																									
C-Face to Face, Run.....																										
D-Centre to Face, Run.....																										
E-Centre to Face, Run.....																										
F-Centre to Face, Branch.....																										

**\*LONG BODY PATTERNS** { Are used when branches are larger than given in the above table, therefore have same dimensions as straight size fittings.  
 The dimensions of Reducing Flanged Fittings are always regulated by the reduction of the branch; fittings reducing on the run only, the long body pattern will always be used.

# **TEMPLATES FOR DRILLING STANDARD AND LOW PRESSURE FLANGED VALVES AND FITTINGS**

**Table No. 34**

Inches Size	Diameter of Flanges Inches	Thickness of Flanges Inches	Bolt Circle Inches	Number of Bolts	Size of Bolts Inches
1	4	$\frac{3}{8}$	3	4	$\frac{3}{8}$
$1\frac{1}{4}$	$4\frac{1}{2}$	$\frac{1}{2}$	$3\frac{3}{8}$	4	$\frac{3}{8}$
$1\frac{1}{2}$	5	$\frac{5}{16}$	$3\frac{7}{8}$	4	$\frac{1}{2}$
2	6	$\frac{5}{8}$	$4\frac{3}{4}$	4	$\frac{5}{8}$
$2\frac{1}{2}$	7	$\frac{9}{16}$	$5\frac{1}{2}$	4	$\frac{5}{8}$
3	$7\frac{1}{2}$	$\frac{3}{4}$	6	4	$\frac{5}{8}$
$3\frac{1}{2}$	$8\frac{1}{2}$	$\frac{9}{16}$	7	4	$\frac{5}{8}$
4	9	$\frac{5}{8}$	$7\frac{1}{2}$	8	$\frac{5}{8}$
$4\frac{1}{2}$	$9\frac{1}{4}$	$\frac{5}{8}$	$7\frac{3}{4}$	8	$\frac{3}{4}$
5	10	$\frac{5}{8}$	$8\frac{1}{2}$	8	$\frac{3}{4}$
6	11	1	$9\frac{1}{2}$	8	$\frac{3}{4}$
7	$12\frac{1}{2}$	$1\frac{1}{8}$	$10\frac{3}{4}$	8	$\frac{3}{4}$
8	$13\frac{1}{2}$	$1\frac{1}{8}$	$11\frac{3}{4}$	8	$\frac{3}{4}$
9	15	$1\frac{1}{8}$	$13\frac{1}{4}$	12	$\frac{3}{4}$
10	16	$1\frac{3}{8}$	$14\frac{1}{4}$	12	$\frac{1}{2}$
12	19	$1\frac{1}{4}$	17	12	$\frac{1}{2}$
14	21	$1\frac{3}{8}$	$18\frac{3}{4}$	12	1
15	$22\frac{1}{4}$	$1\frac{3}{8}$	20	16	1
16	$23\frac{1}{2}$	$1\frac{3}{8}$	$21\frac{1}{4}$	16	1
18	25	$1\frac{9}{16}$	$22\frac{3}{4}$	16	$1\frac{1}{8}$
20	$27\frac{1}{2}$	$1\frac{11}{16}$	25	20	$1\frac{1}{8}$
22	$29\frac{1}{2}$	$1\frac{5}{8}$	$27\frac{1}{4}$	20	$1\frac{1}{4}$
24	32	$1\frac{7}{8}$	$29\frac{1}{2}$	20	$1\frac{1}{4}$
26	$34\frac{1}{4}$	2	$31\frac{3}{4}$	24	$1\frac{1}{4}$
28	$36\frac{1}{2}$	$2\frac{1}{8}$	34	28	$1\frac{1}{4}$
30	$38\frac{3}{4}$	$2\frac{1}{8}$	36	28	$1\frac{3}{8}$
32	$41\frac{3}{4}$	$2\frac{1}{4}$	$38\frac{1}{2}$	28	$1\frac{1}{2}$
34	$43\frac{3}{4}$	$2\frac{3}{8}$	$40\frac{1}{2}$	32	$1\frac{1}{2}$
36	46	$2\frac{3}{8}$	$42\frac{3}{4}$	32	$1\frac{1}{2}$
38	$48\frac{3}{4}$	$2\frac{3}{8}$	$45\frac{1}{4}$	32	$1\frac{3}{4}$
40	$50\frac{3}{4}$	$2\frac{1}{2}$	$47\frac{1}{4}$	36	$1\frac{3}{4}$

These Drilling Templates are in multiples of four, so that fittings may be made to face in any quarter and bolt holes straddle the centre line.

Bolt holes are drilled  $\frac{1}{8}$  inch larger than nominal diameter of bolts.

## TEMPLATES FOR DRILLING—Continued

Size Inches	Diameter of Flanges Inches	Thickness of Flanges Inches	Bolt Circle Inches	Number of Bolts	Size of Bolts Inches
42	53	$2\frac{5}{8}$	$49\frac{1}{2}$	36	$1\frac{1}{2}$
44	$55\frac{1}{4}$	$2\frac{5}{8}$	$51\frac{1}{4}$	40	$1\frac{1}{2}$
46	$57\frac{1}{4}$	$2\frac{3}{4}$	$53\frac{3}{4}$	40	$1\frac{1}{2}$
48	$59\frac{1}{2}$	$2\frac{3}{4}$	56	44	$1\frac{1}{2}$
50	$61\frac{3}{4}$	$2\frac{3}{4}$	$58\frac{1}{4}$	44	$1\frac{3}{4}$
52	64	$2\frac{7}{8}$	$60\frac{1}{2}$	44	$1\frac{3}{4}$
54	$66\frac{1}{4}$	3	$62\frac{3}{4}$	44	$1\frac{3}{4}$
56	$68\frac{3}{4}$	3	65	48	$1\frac{3}{4}$
58	71	$3\frac{1}{8}$	$67\frac{1}{4}$	48	$1\frac{3}{4}$
60	73	$3\frac{1}{8}$	$69\frac{1}{4}$	52	$1\frac{3}{4}$
62	$75\frac{3}{4}$	$3\frac{1}{4}$	$71\frac{3}{4}$	52	$1\frac{1}{2}$
64	78	$3\frac{1}{4}$	74	52	$1\frac{1}{2}$
66	80	$3\frac{3}{8}$	76	52	$1\frac{1}{2}$
68	$82\frac{1}{4}$	$3\frac{3}{8}$	$78\frac{1}{4}$	56	$1\frac{1}{2}$
70	$84\frac{1}{2}$	$3\frac{1}{2}$	$80\frac{1}{2}$	56	$1\frac{1}{2}$
72	$86\frac{1}{2}$	$3\frac{1}{2}$	$82\frac{1}{2}$	60	$1\frac{1}{2}$
74	$88\frac{1}{2}$	$3\frac{5}{8}$	$84\frac{1}{2}$	60	$1\frac{1}{2}$
76	$90\frac{3}{4}$	$3\frac{5}{8}$	$86\frac{1}{2}$	60	$1\frac{1}{2}$
78	93	$3\frac{3}{4}$	$88\frac{3}{4}$	60	2
80	$95\frac{1}{4}$	$3\frac{3}{4}$	91	60	2
82	$97\frac{1}{2}$	$3\frac{7}{8}$	$93\frac{1}{4}$	60	2
84	$99\frac{3}{4}$	$3\frac{7}{8}$	$95\frac{1}{2}$	64	2
86	102	4	$97\frac{3}{4}$	64	2
88	$104\frac{1}{4}$	4	100	68	2
90	$106\frac{1}{2}$	$4\frac{1}{8}$	$102\frac{1}{4}$	68	$2\frac{1}{2}$
92	$108\frac{3}{4}$	$4\frac{1}{8}$	$104\frac{1}{2}$	68	$2\frac{1}{2}$
94	111	$4\frac{1}{4}$	$106\frac{1}{4}$	68	$2\frac{1}{2}$
96	$113\frac{1}{4}$	$4\frac{1}{4}$	$108\frac{1}{2}$	68	$2\frac{1}{4}$
98	$115\frac{1}{2}$	$4\frac{3}{8}$	$110\frac{3}{4}$	68	$2\frac{1}{4}$
100	$117\frac{3}{4}$	$4\frac{3}{8}$	113	68	$2\frac{1}{4}$

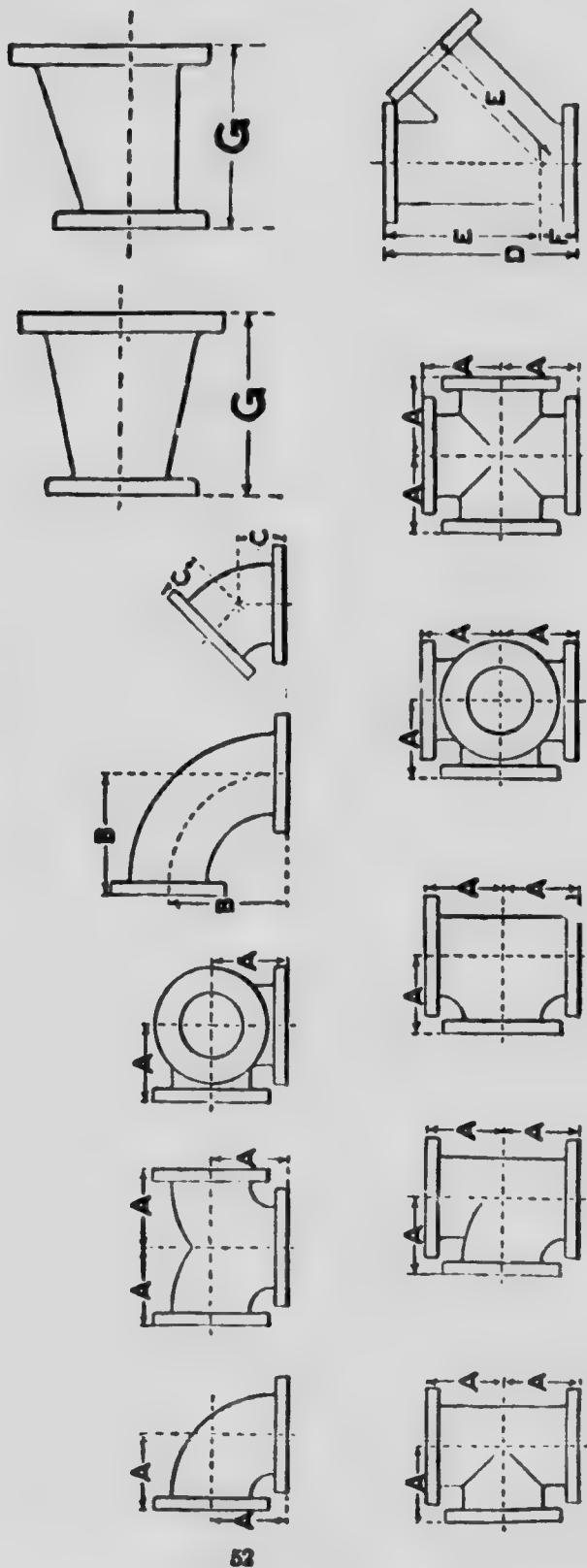
These Drilling Templates are in multiples of four, so that fittings may be made to face in any quarter and bolt holes straddle the centre line.

Bolt holes are drilled  $\frac{1}{8}$  inch larger than nominal diameter of bolts.



# EXTRA HEAVY FLANGED FITTINGS

## Straight Sizes



GENERAL DIMENSIONS

EXTRA HEAVY FLANGED FITTINGS

STRAIGHT SIZES

(ALL DIMS. ARE IN INCHES)

Table No. 35

Size.....	1	1½	2	2½	3	3½	4	4½	5	6	7	8	9	10	12	14	15
AA-Face to Face, Tees and Crosses.....	8	8½	9	10	11	12	13	14	15	16	17	18	20	21	23	26	30
A-Centre to Face, Ells, Tees and Crosses.....	4	4½	5	5½	6	6½	7	7½	8	8½	9	10	10½	11½	13	15	15½
B-Centre to Face, Long Radius Ells.....	5	5½	6	6½	7	7½	8	9	10	11	12	13	14	15	16½	19	21½
C-Centre to Face 45° Ells.....	2	2½	3	3½	4	4½	5	5½	6	6½	7	8	8½	9	10	11	12
D-Face to Face, Laterals.....	8½	9½	11	11½	13	14	15½	16½	18	18½	21½	23½	25½	27½	29½	33½	37½
E-Centre to Face, Laterals.....	6½	7½	8½	9	10½	11	12½	13½	14½	15	17½	19	20½	22½	24	27½	31
F-Centre to Face, Laterals.....	2	2½	2½	2½	3	3	3	3	3½	3½	4	4½	5	5	5½	6	6½
G-Face to Face, Reducers.....	4½	5	6	6½	7½	8½	9	10	10½	11	12½	14	15	16½	17½	20½	23
Diameter of Flanges.....	¾	¾	¾	¾	1	1	1½	1½	1½	1½	1½	1½	1½	1½	1½	2	2½
Thickness of Flanges.....	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½
Minimum Metal Thickness of Body.....	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48
Size.....	33	36	39	41	45	48	52	55	58	61	65	68	71	74	78	81	84
AA-Face to Face, Tees and Crosses.....	16½	18	19½	20½	22½	24	26	27½	29	30½	32½	34	35½	37	39	40½	42
A-Centre to Face, Ells, Tees and Crosses.....	24	26½	29	31½	34	36½	39	41½	44	46½	49	51½	54	56½	59	61½	64
B-Centre to Face, Long Radius Ells.....	9½	10	10½	11	12	13	14	15	16	17	18	19	20	21	22	23	24
C-Centre to Face 45° Ells.....	42	45½	49	53	57½	61½	65	68	71	74	78	81	84	87	90	93	96
D-Face to Face, Laterals.....	34½	37½	40½	43½	47½	51½	55	58	61	64	67	70	73	76	79	82	85
E-Centre to Face, Laterals.....	7½	8	8½	9½	10	11	12	13	14	15	16	17	18	19	20	21	22
F-Centre to Face, Laterals.....	18	19	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48
G-Face to Face, Reducers.....	23½	28	30½	33	36	38½	40½	43	45½	47½	50	52½	54½	57	59½	61½	65
Diameter of Flanges.....	2¼	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½	2½
Thickness of Flanges.....	1¼	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½
Minimum Metal Thickness of Body.....	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48

# EXTRA HEAVY FLANGED FITTINGS GENERAL DIMENSIONS REDUCING TEES AND CROSSES (ALL DIMENSIONS ARE IN INCHES)

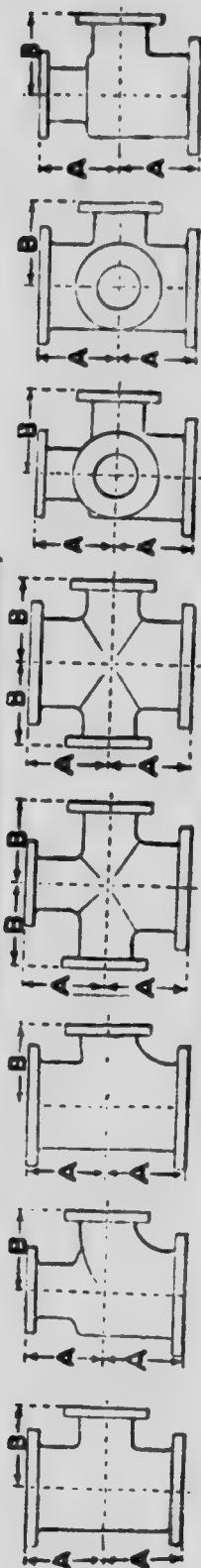


Table No. 36—SHORT BODY PATTERN

Size.....	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8	9	10	12	14	15	16
*Size of Outlet and Smaller.....																			
AA-Face to Face, Run.....																			
A-Centre to Face, Run.....																			
B-Centre to Face, Outlet.....																			
Size.....	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54
*Size of Outlet and Smaller.....	12	14	15	16	18	18	20	20	22	24	24	26	28	30	32	34	36	38	40
AA-Face to Face, Run.....	28	31	33	34	38	38	41	41	44	47	47	50	53	55	58	61	64	67	70
A-Centre to Face, Run.....	14	15 1/2	16 1/2	17	19	19	20 1/2	20 1/2	22	23 1/2	23 1/2	25	26 1/2	28 1/2	30 1/2	32 1/2	34 1/2	36 1/2	38 1/2
B-Centre to Face, Outlet.....	17	18 1/2	20	21 1/2	23	24	25 1/2	26 1/2	28	29 1/2	30 1/2	31 1/2	33 1/2	35 1/2	37 1/2	39 1/2	41 1/2	43 1/2	45 1/2

All reducing fittings 1" to 16" inclusive have the same centre to face dimensions as straight size fittings.

\*LONG BODY PATTERNS { Are used when outlets are larger than given in the above table, therefore have same dimensions as straight size fittings.

The dimensions of "Reducing Flanged Fittings" are always regulated by the reduction of the outlet.

FITTINGS REDUCING ON THE RUN ONLY, the long body pattern will always be used, except Double Sweep Tees, on which the reduced end is always longer than the regular fitting. Dimensions on request.

BULL HEADS OR TEES having outlet larger than the run, will be the same length centre to face of all openings as a tee with all openings of the size of the outlet. For example: a 12 x 12 x 16 inch tee will be governed by the dimensions of the 16 inch long body tee—namely, 16 1/2 inches centre to face of all openings and 33 inches face to face.

REDUCING ELBOWS carry same centre to face dimension as regular elbow of largest straight size.

REDUCING ELBOWS carry same centre to face dimension as regular elbow of largest straight size.

EXTRA HEAVY FLANGED FITTINGS  
GENERAL DIMENSIONS-REDUCING LATERALS  
(ALL DIMENSIONS ARE IN INCHES)

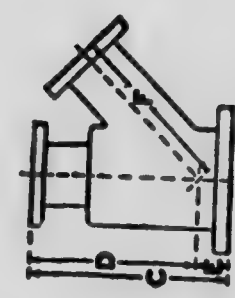
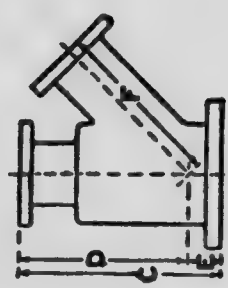


Table No. 37

SHORT BODY PATTERN

Size.....	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8	9	10	12	14	15	16	18	20	22	24
*Size of Branch and Smaller.....																							
C-Face to Face, Run.....																							
D-Centre to Face, Run.....																							
E-Centre to Face, Run.....																							
F-Centre to Face, Branch.....																							

All reducing fittings 1" to 16" inclusive have same centre to face dimensions as straight size fittings.

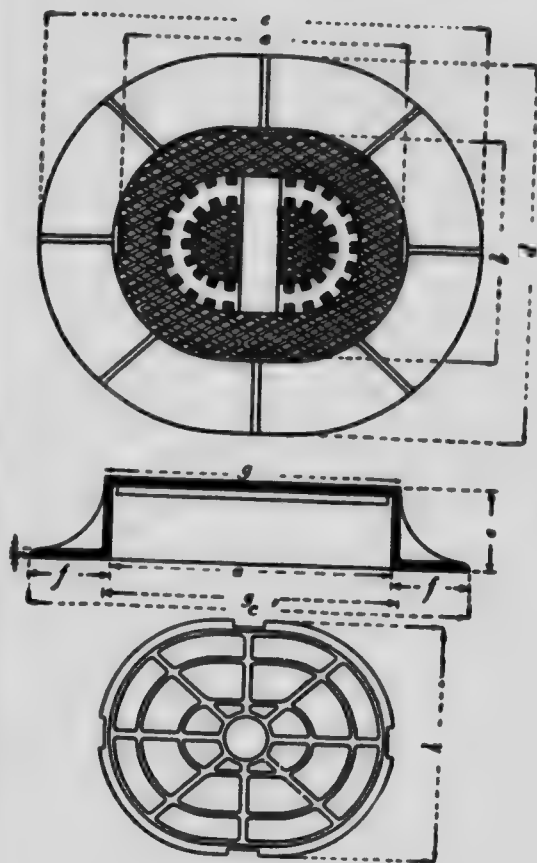
\*LONG BODY PATTERNS { Are used when branches are larger than given in the above table, therefore have same dimensions as straight size fittings.  
The dimensions of "Reducing Flange Fittings" are always regulated by the reduction of the branch; fittings reducing on the run only, the long body pattern will always be used.

**TEMPLATES FOR DRILLING  
EXTRA HEAVY FLANGED VALVES AND FITTINGS**  
**Table No. 38**

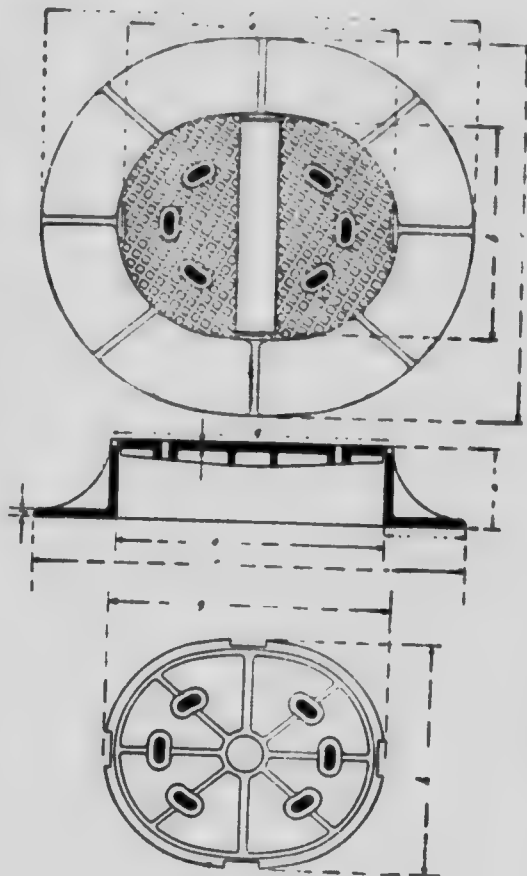
Size Inches	Diameter of Flanges Inches	Thickness of Flanges Inches	Bolt Circle Inches	Number of Bolts	Size of Bolts Inches
1	4½	¾	3¼	4	½
1¼	5	¾	3¾	4	½
1½	6	¾	4½	4	⅝
2	6½	7⁄8	5	4	⅝
2½	7½	1	5⅞	4	¾
3	8¼	1 1⁄8	6⅝	8	¾
3½	9	1 3⁄8	7¼	8	¾
4	10	1 ¼	7⅞	8	¾
4½	10½	1 5⁄8	8½	8	¾
5	11	1 3⁄8	9¼	8	¾
6	12½	1 7⁄8	10⅝	12	¾
7	14	1 ½	11⅞	12	7⁄8
8	15	1 5⁄8	13	12	7⁄8
9	16¼	1 ¾	14	12	1
10	17½	1 7⁄8	15¼	16	1
12	20½	2	17⅝	16	1 1⁄8
14	23	2 1⁄8	20¼	20	1 1⁄8
15	24½	2 3⁄8	21½	20	1 ¼
16	25½	2 ¼	22½	20	1 ¼
18	28	2 3⁄8	24¾	24	1 ¼
20	30½	2 ½	27	24	1 3⁄8
22	33	2 5⁄8	29¼	24	1 ½
24	36	2 ¾	32	24	1 5⁄8
26	38¼	2 ¾	34½	28	1 5⁄8
28	40¾	2 5⁄8	37	28	1 5⁄8
30	43	3	39¾	28	1 ¾
32	45¼	3 1⁄8	41½	28	1 7⁄8
34	47½	3 ¼	43½	28	1 7⁄8
36	50	3 3⁄8	46	32	1 7⁄8
38	52¼	3 7⁄8	48	32	1 7⁄8
40	54½	3 9⁄8	50¼	36	1 7⁄8
42	57	3 11⁄8	52¾	36	1 7⁄8
44	59¼	3 ¾	55	36	2
46	61½	3 7⁄8	57¼	40	2
48	65	4	60¾	40	2

These Drilling Templates are in multiples of four, so that fittings may be made to face in any quarter, and bolt holes straddle the centre line.  
Bolt holes are drilled ⅛ inch larger than nominal diameter of bolts.

## STANDARD SPECIAL CASTINGS



Style No. 1



Styel No.2

**Table No. 39—Manhole Frames and Covers**

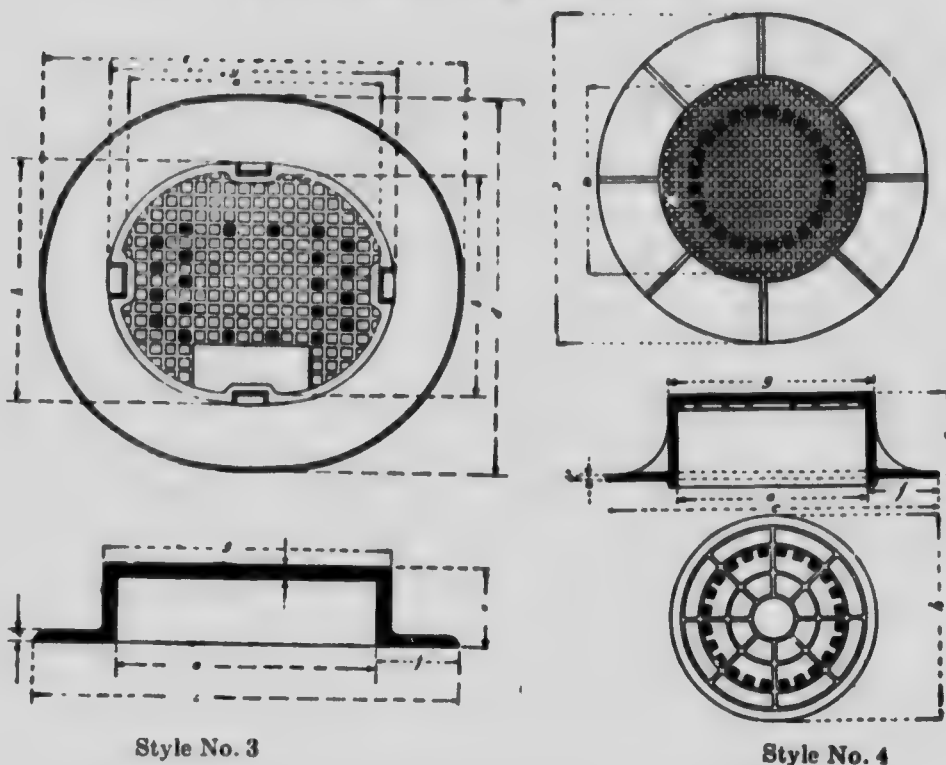
Style	a	b	c	d	e	f	g	h	t	t1	lbs.
No. 1.....	30	24	46	40	8¾	8	31	25	¾	1	500
No. 2.....	30	24	48	42	9	9	31½	25½	1	¾	525

The lowest cut shows the form of strengthening the ribs on the under side of the cover.

Style No. 1 has heavy diamond top with 40 holes one inch square in the centre.

Style No. 2 has 6 holes each 2¼ inches by 1 inch in the centre.

## STANDARD SPECIAL CASTINGS



**Table No. 40—Manhole Frames and Covers**  
—Continued

Style	a	b	c	d	e	f	g	h	t	t1	lbs.
No. 3..	32½	27	48½	43	9	8	34½	29	1½	1¼	800
No. 4..	24	24	42	42	9⅝	9	25¾	25¾	1	1	500

Style No. 3 has 22 holes 1¼ inches square in the centre.

Style No. 4 is circular and the lowest cut shows the form of strengthening the ribs under the cover.

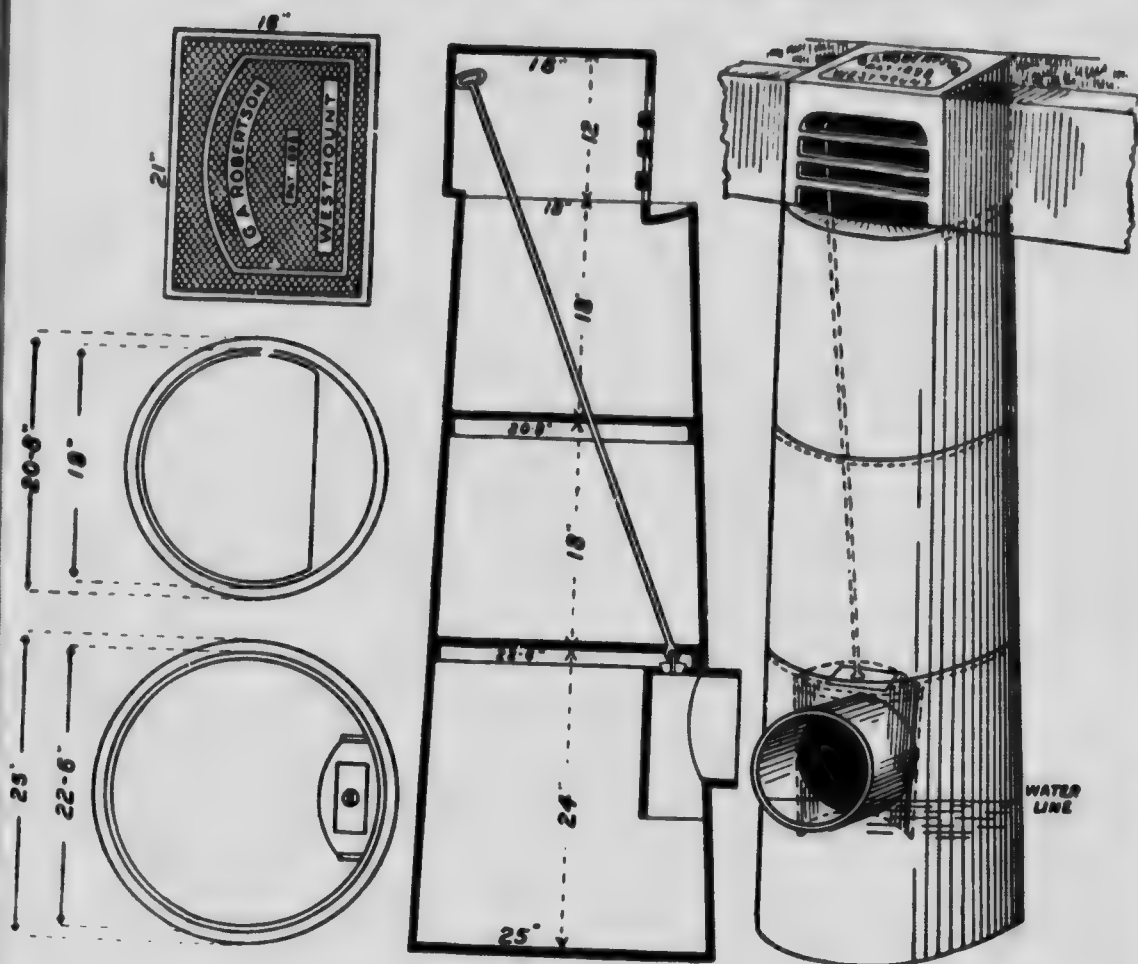
**Table No. 41—Adjustable Valve Boxes**

a	b	c	d	e	f	g	lbs.
30	45	7	6¼	12	9	7¼	175





**THE G. A. ROBERTSON CULLY**  
**Manufactured Solely by**  
**CANADA IRON FOUNDRIES LIMITED**



The G. A. Robertson Catch Basin and Gully, manufactured solely by Canada Iron Foundries, Limited, has many points of superiority over any other now in use.

1. The lipped inlet prevents ice from accumulating on the inside.
2. The trap is set in a groove and is well below the outlet. The escape of sewer gas is therefore prevented.
3. The form is tapering and the flanges at the joints are inside. The surface is left plain and the frost has no effect upon it.
4. A handle attached to the plug in the top of the trap always remains in the gully and enables anyone to clear it of storm water in an instant, should it become blocked on the lower side with sand, etc., which often occurs during thunderstorms and heavy rains.

# CAPACITY OF CAST IRON PIPE

Table No. 42

Table of contents in cubic feet and Imperial and United States gallons, and weight of water (at 62½ pounds per cubic foot) contained in one foot lengths of different internal diameters of pipe, and square root of diameter in feet.

Diameter in Inches	Diam. in Feet	Imperial Gals. of 277.274 Cubic Inches	United States Gals. of 231 Cubic Inches	Weight of Water Pounds	Square Root of Diam. in Feet	Diameter in Inches	Diam. in Feet	Imperial Gals. of 277.274 Cubic Inches	United States Gals. of 231 Cubic Inches	Weight of Water Pounds	Square Root of Diam. in Feet
1	.0833	.0340	.0108	.3395	.280	25	2.083	21.25	25.50	212.20	1.443
2	.1667	.1360	.1632	1.358	.408	26	2.167	22.99	27.58	229.51	1.472
3	.2500	.3060	.3672	3.055	.500	27	2.250	24.79	29.74	247.51	1.500
4	.3333	.5440	.6528	5.432	.579	28	2.333	26.66	31.99	266.18	1.528
5	.4167	.850	1.020	8.488	.645	29	2.417	28.60	34.31	285.53	1.555
6	.5000	1.224	1.469	12.223	.707	30	2.500	30.60	36.72	305.57	1.581
7	.5833	1.666	1.999	16.636	.764	31	2.583	32.68	39.21	326.27	1.607
8	.6667	2.176	2.611	21.729	.817	32	2.667	34.82	41.78	347.66	1.633
9	.7500	2.754	3.305	27.501	.866	33	2.750	37.03	44.43	369.74	1.659
10	.8333	3.400	4.080	33.952	.913	34	2.833	39.30	47.16	392.48	1.683
11	.9167	4.114	4.937	41.082	.957	35	2.917	41.65	49.98	415.90	1.708
12	1.	4.896	5.875	48.891	1.000	36	3.	44.07	52.88	440.00	1.732
13	1.083	5.746	6.895	57.379	1.041	37	3.083	46.55	55.86	464.80	1.756
14	1.167	6.664	7.997	66.545	1.080	38	3.167	49.10	58.92	490.24	1.779
15	1.250	7.650	9.180	76.392	1.118	39	3.250	51.72	62.06	516.40	1.803
16	1.333	8.70	10.44	86.916	1.155	40	3.333	54.40	65.28	543.24	1.825
17	1.417	9.83	11.79	98.121	1.190	41	3.417	57.15	68.55	570.72	1.849
18	1.500	11.02	13.22	110.	1.224	42	3.500	59.98	71.97	598.92	1.871
19	1.583	12.28	14.73	122.56	1.258	43	3.583	62.87	75.44	627.81	1.894
20	1.667	13.60	16.32	135.81	1.291	44	3.667	65.83	78.99	657.32	1.915
21	1.750	15.00	17.99	149.73	1.323	45	3.750	68.85	82.62	687.56	1.937
22	1.833	16.46	19.75	164.33	1.354	46	3.833	71.95	86.33	718.40	1.958
23	1.917	17.99	21.58	179.60	1.384	47	3.917	75.11	90.13	750.06	1.979
24	2.	19.59	23.50	195.56	1.414	48	4.	78.34	94.00	782.24	2.000

For larger diameters than those given, take one-half the size required from the table, and multiply by 4; so also with gallons and weights.

## NOTES

An Imperial Gallon = 277.274 cubic inches = 10 lbs. at 62° F.  
 A United States Gallon = 231 cubic inches = 8.3356 lbs. at 62° F.  
 6.2321 Imperial Gallons = 1 cubic foot = 7.4805 U.S. Gallons.  
 1 Imperial Gallon = 1.20032 U.S. Gallons.

Table No. 43—Frictional Heads at Given Rates of Discharge in Clean Cast Iron Pipe for each 1,000 Feet of Length

U. S. Gallons Discharged per Minute		U. S. Gallons Discharged per Twenty-four Hours		Imp. Gallons Discharged per Minute		Imp. Gallons Discharged per Twenty-four Hours		4-inch Pipe			6-inch Pipe			8-inch Pipe			10-inch Pipe			12-inch Pipe			14-inch Pipe		
U. S. Gallons		U. S. Gallons		Imp. Gallons		Imp. Gallons		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours		Discharged per Minute		Discharged per Twenty-four Hours		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head		Velocity in Feet		Frictional Head			
Discharged per Minute		Discharged per Twenty-four Hours</																							

Table No. 44—Frictional Heads at Given Rates of Discharge in Clean Cast Iron Pipe for Each 1 000 Feet of Length—Continued

U. S. Gallons per Minute		U. S. Gallons Discharged per Twenty-four Hours		16-inch Pipe			19-inch Pipe			20-inch Pipe			24-inch Pipe			30-inch Pipe			36-inch Pipe		
				Frictional Head		Velocity in Feet	Frictional Head		Velocity in Feet	Frictional Head		Velocity in Feet	Frictional Head		Velocity in Feet	Frictional Head		Velocity in Feet	Frictional Head		Velocity in Feet
				Feet	Lbs.		Feet	Lbs.		Feet	Lbs.		Feet	Lbs.		Feet	Lbs.		Feet	Lbs.	
500	720,000	416.66	600,000	22	.09	.63	.13	.06	.51	.08	.04	.35	.04	.02	.23	.01	.00	.16	.01	.00	.16
1,000	1,440,000	833.33	1,200,000	76	.34	1.26	.44	.19	1.02	.27	.12	.68	.12	.05	.45	.04	.02	.32	.02	.01	.32
1,500	2,160,000	1,250.00	1,800,000	239	1.63	1.89	.93	.40	1.53	.56	.24	1.06	.24	.10	.68	.09	.04	.47	.04	.02	.47
2,000	2,880,000	1,666.66	2,400,000	319	2.82	2.52	1.60	.69	2.04	.96	.42	1.42	.41	.18	.91	.13	.06	.63	.06	.03	.63
2,500	3,600,000	2,083.33	3,000,000	399	4.34	3.15	2.45	1.06	2.55	1.47	.64	1.77	.62	.27	1.13	.22	.09	.70	.09	.04	.70
3,000	4,320,000	2,500.00	3,600,000	479	6.19	3.78	3.48	1.51	3.06	2.09	.90	2.13	.87	.38	1.36	.30	.13	.95	.13	.06	.95
3,500	5,040,000	2,916.66	4,200,000	559	8.37	4.41	4.70	2.03	3.57	2.81	1.22	2.48	1.16	.59	1.59	.40	.17	1.10	.17	.07	1.10
4,000	5,760,000	3,333.33	4,800,000	638	10.87	4.71	5.04	2.64	4.08	3.64	1.58	2.84	1.50	.82	1.82	.52	.22	1.58	.22	.09	1.58
4,500	6,480,000	3,750.00	5,400,000	718	13.70	5.93	6.67	3.32	4.59	4.58	1.98	3.19	1.88	.82	2.04	.64	.28	1.42	.27	.12	1.42
5,000	7,200,000	4,166.66	6,000,000	798	16.85	7.30	8.43	4.08	5.11	5.62	2.43	3.55	2.31	1.00	2.27	.78	.34	1.58	.33	.14	1.58
5,500	7,920,000	4,583.33	6,600,000	878	20.33	8.71	11.38	4.92	5.62	6.77	2.93	3.90	2.77	1.20	2.50	.94	.41	1.73	.39	.17	1.73
6,000	8,640,000	5,000.00	7,200,000	958	24.22	10.00	14.84	5.84	6.13	8.03	3.48	4.26	3.28	1.42	2.72	1.11	.48	1.89	.46	.20	1.89
7,000	10,080,000	5,833.33	8,400,000	1,118	32.67	11.67	19.84	7.15	7.15	10.86	4.71	4.96	4.43	1.92	3.15	1.49	.65	2.21	.62	.27	2.21
8,000	11,520,000	6,666.66	9,600,000	1,278	41.67	13.33	25.84	8.08	8.08	14.84	5.67	5.75	5.25	2.49	3.63	1.83	.84	2.52	.80	.35	2.52
9,000	12,960,000	7,500.00	10,800,000	1,438	51.22	15.00	32.84	9.00	9.00	18.84	6.38	7.23	6.34	3.14	4.08	2.43	1.05	2.84	1.00	.43	2.84
10,000	14,400,000	8,333.33	12,000,000	1,598	61.27	16.67	40.84	10.00	10.00	22.84	7.15	8.03	7.15	3.84	4.54	2.98	1.29	3.15	1.23	.53	3.15
11,000	15,840,000	9,166.66	13,200,000	1,758	71.82	18.33	49.84	11.00	11.00	26.84	8.08	9.00	8.08	4.54	5.00	3.59	1.55	3.46	1.47	.64	3.46
12,000	17,280,000	10,000.00	14,400,000	1,918	82.87	20.00	59.84	12.00	12.00	30.84	9.00	10.00	9.00	5.25	5.44	4.25	1.84	3.78	1.74	.75	3.78
13,000	18,720,000	10,833.33	15,600,000	2,078	94.42	21.67	69.84	13.00	13.00	34.84	10.00	11.00	10.00	6.00	5.90	4.97	2.15	4.09	2.03	.88	4.09
14,000	20,160,000	11,666.66	16,800,000	2,238	105.97	23.33	79.84	14.00	14.00	38.84	11.00	12.00	11.00	6.75	6.36	5.75	2.49	4.41	2.35	1.02	4.41
15,000	21,600,000	12,500.00	18,000,000	2,398	117.52	25.00	89.84	15.00	15.00	42.84	12.00	13.00	12.00	7.50	6.80	6.58	2.85	4.73	2.69	1.17	4.73
16,000	23,040,000	13,333.33	19,200,000	2,558	129.07	26.67	99.84	16.00	16.00	46.84	13.00	14.00	13.00	8.25	7.15	7.15	3.14	5.05	3.04	1.32	5.05
17,000	24,480,000	14,166.66	20,400,000	2,718	140.62	28.33	109.84	17.00	17.00	50.84	14.00	15.00	14.00	9.00	7.44	7.44	3.43	5.36	3.43	1.49	5.36
18,000	25,920,000	15,000.00	21,600,000	2,878	152.17	30.00	119.84	18.00	18.00	54.84	15.00	16.00	15.00	9.75	7.73	7.73	3.72	5.68	3.72	1.66	5.68
20,000	28,800,000	16,666.66	24,000,000	3,398	184.22	33.33	149.84	20.00	20.00	64.84	16.00	18.00	16.00	11.25	8.60	8.60	4.25	6.30	4.25	2.04	6.30

APPLICATION OF THESE TABLES—Continued

(3) For example, what loss of pressure due to friction will occur in the delivery of 750 Imperial gallons, or 900 U. S. gallons, of water per minute through a 10-inch pipe 4,000 feet long to a point 100 feet above the pump—or, rather, what extra head will it be necessary to calculate upon in consequence of this friction loss in order to deliver this quantity under these conditions? The table shows that the frictional head of 10-inch pipe delivering 750 Imperial gallons, or 900

U. S. gallons per minute, is 5.93 ft. per 1,000 ft. head or 23.72 ft. for 4,000 ft. of pipe. It will therefore be necessary to provide for a pressure due to a head of 123.72 ft.

(4) For example, if the frictional loss is 2½ lbs. pressure in 1,000 ft. of 10-inch pipe, the table shows a flow of 750 Imperial gallons, or 900 U. S. gallons, per minute. If the frictional loss amounted to 4½ lbs. there would be a flow of 1,000 Imperial gallons, or 1200 U. S. gallons, per minute.

## FRICTION HEADS FOR ELBOWS

Heads required to overcome the resistance of ninety-degree circular bends.

**Table No. 45**

Velocity in Feet per Second	Radius of Bend in Diameters of Pipe							
	0.5	0.75	1.00	1.25	1.5	2.0	3.0	5.0
	Head, in Feet							
1	.016	.005	.002	.002	.001	.001	.001	.001
2	.062	.018	.009	.007	.005	.005	.004	.004
3	.140	.041	.020	.015	.012	.011	.010	.009
4	.224	.072	.036	.026	.021	.019	.017	.016
5	.388	.113	.056	.041	.033	.029	.027	.025
6	.559	.162	.081	.059	.048	.042	.038	.036
7	.761	.221	.110	.080	.066	.057	.052	.050
8	.994	.288	.114	.104	.086	.074	.069	.065
9	1.260	.365	.182	.132	.108	.094	.086	.082
10	1.550	.450	.225	.163	.134	.116	.106	.101
12	2.340	.649	.324	.236	.192	.167	.153	.145

The above table has been calculated by the well known Weisbach formula, for pipe or bends of circular cross section, i. e., round water pipe specials.

Let  $R$  = radius of curve or bend in inches

$r$  = radius of section of pipe in inches

$K$  = coefficient of resistance

$v$  = velocity of flow in feet per second

$a^\circ$  = angle embraced by curve or bend (a right angle bend =  $90^\circ$ )

$h$  = friction head in feet or decimal of foot

$g$  = acceleration due to gravity = 32.2

Then 
$$K = 0.131 + 1.847 \left\{ \frac{r}{R} \right\} \frac{7}{2}$$

And 
$$h = K \frac{v^2}{2g} \times \frac{a^\circ}{180}$$

Suppose a  $90^\circ$  bend of circular cross section, 20 inches diameter ( $r=10$ ) and 25 inches radius of curvature ( $=R$ .) what friction head is developed by a velocity of flow of 27,896 feet per second?

$$K = 0.131 + 1.847 \left\{ \frac{10}{25} \right\} \frac{7}{2} = 0.206$$

And 
$$h = .206 \frac{27,896^2}{64.4} \times \frac{90}{180} = 0.01245 \text{ feet}$$



Table No. 46

For Converting Feet Head of Water into Pressure per Square Inch						For Converting Pressure per Square Inch into Feet Head of Water					
Feet Head	Lbs. per Sq. Inch	Feet Head	Lbs. per Sq. Inch	Feet Head	Lbs. per Sq. Inch	Lbs. per Sq. Inch	Feet Head	Lbs. per Sq. Inch	Feet Head	Lbs. per Sq. Inch	Feet Head
1	.43	55	23.82	190	82.29	1	2.31	55	126.99	190	438.90
2	.87	60	25.99	200	86.62	2	4.62	60	138.54	200	461.78
3	1.30	65	28.15	225	97.45	3	6.93	65	150.08	225	519.51
4	1.73	70	30.32	250	108.27	4	9.24	70	161.63	250	577.24
5	2.17	75	32.48	275	119.10	5	11.54	75	173.17	275	643.06
6	2.60	80	34.65	300	129.93	6	13.85	80	184.72	300	692.69
7	3.03	85	36.81	325	140.75	7	16.16	85	196.26	325	750.41
8	3.40	90	38.98	350	151.58	8	18.47	90	207.81	350	808.13
9	3.90	95	41.14	375	162.41	9	20.78	95	219.35	375	865.89
10	4.33	100	43.31	400	173.24	10	23.09	100	230.90	400	922.58
15	6.50	110	47.64	500	216.55	15	34.63	110	253.98	500	1154.48
20	8.66	120	51.97	600	259.85	20	46.18	120	277.07	...	...
25	10.83	130	56.30	700	303.16	25	57.72	130	300.16	...	...
30	12.99	140	60.63	800	346.47	30	69.27	140	323.25	...	...
35	15.16	150	64.96	900	389.78	35	80.81	150	346.34	...	...
40	17.32	160	69.29	1000	433.09	40	92.36	160	369.43	...	...
45	19.40	170	73.63	...	...	45	103.90	170	392.52	...	...
50	21.65	180	77.96	...	...	50	115.45	180	415.61	...	...

Table No. 47

Table of Fractions with their Corresponding Decimals

$\frac{1}{16}$ inch	.015625	$\frac{1}{12}$ inch	.083333	$\frac{1}{32}$ inch	.03125	$\frac{1}{8}$ inch	.125
$\frac{1}{8}$ "	.03125	$\frac{1}{10}$ "	.1	$\frac{1}{16}$ "	.0625	$\frac{3}{16}$ "	.1875
$\frac{3}{16}$ "	.046875	$\frac{1}{8}$ "	.125	$\frac{1}{8}$ "	.125	$\frac{1}{4}$ "	.25
$\frac{1}{4}$ "	.0625	$\frac{3}{16}$ "	.1875	$\frac{3}{16}$ "	.1875	$\frac{5}{16}$ "	.3125
$\frac{5}{16}$ "	.078125	$\frac{1}{4}$ "	.25	$\frac{1}{4}$ "	.25	$\frac{3}{4}$ "	.75
$\frac{3}{8}$ "	.09375	$\frac{5}{16}$ "	.3125	$\frac{5}{16}$ "	.3125	$\frac{7}{8}$ "	.875
$\frac{7}{8}$ "	.09375	$\frac{3}{8}$ "	.375	$\frac{3}{8}$ "	.375	$\frac{15}{16}$ "	.9375
$\frac{1}{2}$ "	.125	$\frac{1}{2}$ "	.5	$\frac{1}{2}$ "	.5	$\frac{1}{2}$ "	.5
$\frac{9}{16}$ "	.140625	$\frac{5}{8}$ "	.625	$\frac{5}{8}$ "	.625	$\frac{1}{2}$ "	.5
$\frac{11}{16}$ "	.15625	$\frac{3}{4}$ "	.75	$\frac{3}{4}$ "	.75	$\frac{1}{2}$ "	.5
$\frac{13}{16}$ "	.171875	$\frac{7}{8}$ "	.875	$\frac{7}{8}$ "	.875	$\frac{1}{2}$ "	.5
$\frac{15}{16}$ "	.1875	$\frac{15}{16}$ "	.9375	$\frac{15}{16}$ "	.9375	$\frac{1}{2}$ "	.5
$\frac{17}{16}$ "	.203125	$\frac{1}{2}$ "	.5	$\frac{1}{2}$ "	.5	$\frac{1}{2}$ "	.5
$\frac{19}{16}$ "	.21875	$\frac{1}{2}$ "	.5	$\frac{1}{2}$ "	.5	$\frac{1}{2}$ "	.5
$\frac{21}{16}$ "	.234375	$\frac{1}{2}$ "	.5	$\frac{1}{2}$ "	.5	$\frac{1}{2}$ "	.5
$\frac{23}{16}$ "	.25	$\frac{1}{2}$ "	.5	$\frac{1}{2}$ "	.5	$\frac{1}{2}$ "	.5

Table No. 48

## Pressure Required for Fire Streams through Rubber Hose

Effective Pressure at Nozzle	Gals. Discharged per Minute	Horizontal Distance Reached by Jet	Vertical Distance Reached by Jet	Pressure in Pounds at Hydrant or Steamer to maintain given effective Pressure at Nozzle with different Lengths of Hose									
				Using a 1" Ring Nozzle									
				100 feet	200 feet	300 feet	400 feet	500 feet	600 feet	700 feet	800 feet	900 feet	1000 feet
10	60	49	22	12	13	15	17	18	20	22	23	25	47
20	86	69	42	23	26	28	31	34	37	40	42	45	48
30	105	88	61	34	38	42	46	50	54	58	62	66	70
40	121	105	78	45	50	56	61	66	71	76	82	87	92
50	135	121	92	56	63	69	76	82	88	95	101	108	114
60	148	136	104	68	75	83	91	98	106	114	121	129	137
70	160	149	115	79	88	97	106	115	124	133	142	151	160
80	171	160	124	90	101	111	121	131	142	152	162	172	183
90	181	168	132	102	113	125	136	148	159	171	182	194	205
100	191	174	136	113	126	139	152	164	177	190	203	216	229

## Using a 1½" Ring Nozzle

10	76	49	22	12	15	17	19	22	24	26	29	31	33
20	108	70	43	24	28	33	37	41	45	49	54	58	62
30	132	89	62	36	42	48	55	61	67	73	79	85	92
40	153	108	79	48	56	65	73	81	89	97	106	114	122
50	171	125	94	60	71	81	91	101	112	122	132	142	153
60	188	140	108	72	85	97	110	122	134	147	159	172	184
70	202	154	121	84	99	113	128	142	157	171	186	200	214
80	216	165	131	97	113	130	147	163	180	196	213	229	246
90	229	174	141	109	127	146	165	183	202	221	239	258	277
100	242	181	149	121	142	163	184	205	226	247	268	288	...

## Using a 1¾" Ring Nozzle

10	95	49	22	13	17	20	23	27	30	33	37	40	43
20	134	71	43	26	33	39	45	52	58	64	71	77	83
30	164	92	63	39	49	58	68	77	86	96	105	115	124
40	189	112	80	53	65	78	90	103	116	128	141	153	166
50	211	130	95	66	82	97	113	129	145	161	177	193	208
60	232	146	110	79	98	118	137	156	175	194	214	233	252
70	250	160	123	92	115	137	160	182	204	227	249	271	...
80	268	172	135	106	132	157	183	209	235	...	...	...	...
90	284	182	146	119	148	177	209	235	...	...	...	...	...
100	299	190	155	132	165	197	229	...	...	...	...	...	...

## Using a 2" Ring Nozzle

10	114	49	23	15	19	24	29	33	38	43	37	51	56
20	161	72	43	29	38	47	56	65	75	84	93	102	111
30	198	95	63	44	58	72	85	99	113	127	141	155	169
40	228	116	82	58	77	95	114	132	151	169	188	207	225
50	255	135	99	73	97	120	144	167	190	214	237	260	...
60	280	153	115	88	116	144	173	201	229	...	...	...	...
70	302	169	128	102	136	169	202	235	...	...	...	...	...
80	323	183	141	118	156	194	232	...	...	...	...	...	...
90	343	194	152	133	176	218	...	...	...	...	...	...	...
100	361	203	162	148	196	...	...	...	...	...	...	...	...

As determined by experiments made in the Springfield, Mass., Fire Department by Chief Engineer A. P. Leshure.